MINERAL DEVELOPMENT DIVISION
DEPARTMENT OF MINES AND ENERGY
GOVERNMENT OF NEWFOUNDLAND AND LABRADOR

REPORT OF ACTIVITIES FOR 1985

St. John's, Newfoundland
1985

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Editing and Compilation

Senior Geologist: R.V. Gibbons

Editor: R.F. Blackwood

Word Processing: Deb Downey
Bev Strickland
Joanne Rooney
Judy Lynn Reid
Doreen Peavy
Judy Morgan

Drafting Supervisor: K. Byrne

Drafting: D. Leonard
T. Paltanavage
K. Steinhauer

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Compiled by
R. Frank Blackwood

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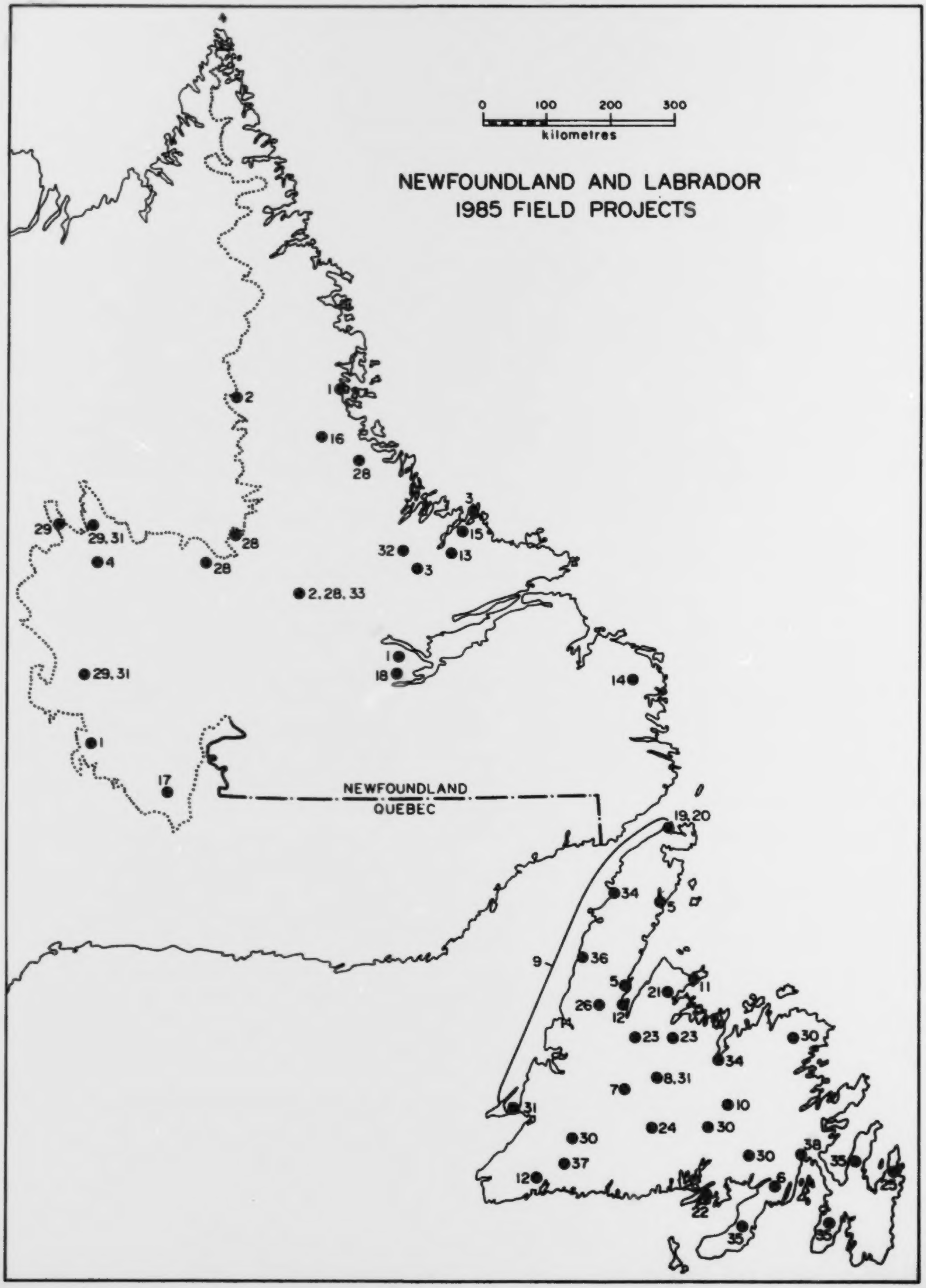

NEWFOUNDLAND AND LABRADOR
1985 FIELD PROJECTS

0
100
200
300
kilometres
NEWFOUNDLAND
QUEBEC
4
2
1
16
28
3
15
13
32
3
29
29, 31
28
4
28
2, 28, 33
29, 31
1
18
14
1
17
19, 20
34
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9
36
5
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11
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12
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30
34
8, 31
7
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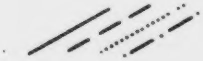
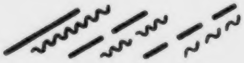
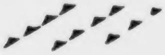
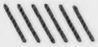
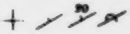
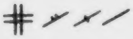
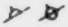
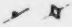
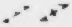
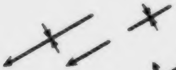
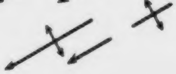
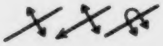
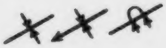
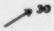
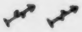
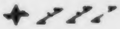
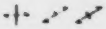
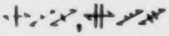
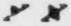
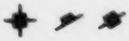
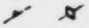
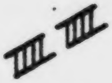
GEOLOGICAL MAP SYMBOLS

Geological contact (defined, approximate, assumed, gradational)	
Fault (defined, approximate, assumed)	
Thrust fault (defined, approximate, assumed)	
Zone of numerous imbricate thrust faults	
Bedding, tops known (horizontal, inclined, vertical, overturned)	
Bedding, tops unknown (horizontal, inclined, vertical, dip unknown)	
Pillow bedding, tops known (inclined, vertical)	
Flow banding (inclined, vertical)	
Fracture cleavage (inclined, vertical)	
Syncline, showing direction of plunge (defined, approximate)	
Anticline, showing direction of plunge (defined, approximate)	
Antiform (horizontal, plunging, overturned)	
Synform (horizontal, plunging, overturned)	
Minor fold axis (with plunge)	
S folds, Z folds	
Gneissic foliation (horizontal, inclined, vertical, dip unknown)	
Schistosity, cleavage, foliation (horizontal, inclined, vertical)	
S_1, S_2	
Foliation due to thrusting (inclined, vertical)	
Lineation, fold axis, mineral rodding	

Jointing (horizontal, inclined, vertical)	
Primary igneous layering (inclined)	
Shear zone (approximate)	
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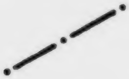
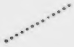
Unconformity	
Contact inferred from magnetic anomaly	
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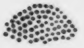
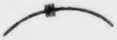
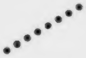
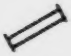
Drift covered area	
Topographic lineaments from aerial photographs	
Road	
Power transmission line	
Mine	⚒ Pb
Mineral Occurrence	× Zn
Location of measured section	

Abbreviations

Arsenopyrite	*asp*	*Iron formation*	*i-f*
Asbestos	*asb*	*Magnetite*	*mag*
Chalcopyrite	*cp*	*Molybdenite*	*mo*
Copper staining	*cs*	*Pyrite*	*py*
Fluorite	*fl*	*Pyrrhotite*	*po*
Galena	*gn*	*Radioactive minerals*	*ra*
Hematite	*hem*	*Serpentine*	*sup*
		Sphalerite	*sp*

Chemical symbols are used for elements, e.g. Cu......copper.

ECONOMIC GEOLOGY

INDUSTRIAL MINERALS IN LABRADOR

by

P.L. Dean and J. Meyer
Mineral Deposits Section

Introduction

The industrial minerals program in Labrador continued in 1985 with investigations in marble, silica, alumina and dimension stone. A follow-up program to the 1984 marble and silica evaluation in western Labrador consisted of a three-week drill program in the dolomitic marbles. A total of nine holes (183 metres of core) were drilled in the vicinity of the two best marble prospects discovered in 1984. Additional silica deposits were investigated in southeastern Labrador, 25 km southwest of Mary's Harbour, where large quartz and feldspar veins form a series of parallel trending ridges with up to 150 m in relief. Anorthosite in the Goose Bay area was evaluated as a source of alumina, and a study of the dimension stone potential of both the Goose Bay and Nain anorthosite complexes was initiated.

The 1985 field season began with a follow-up of shales on the West Coast of Newfoundland. The bulk of this work was carried out in conjunction with North Star Cement Ltd. to help distinguish the geochemistry of shales of various ages and sedimentary environments.

Labrador West

An industrial mineral survey carried out in the Wabush/Labrador City area in 1984 established the presence of high quality silica reserves and very pure dolomitic marble. During the 1985 field season a three-week drill program was carried out to continue the assessment of the dolomitic marble in two Exempt Mineral Land Blocks, which were established as a result of the 1984 sampling program.

Geochemical analyses of chip and channel samples of dolomitic marble from the Aphebian Denault Formation indicate that two areas of exposure could meet the specifications for making self-fluxing iron ore pellets. The Iron Ore Company of Canada is considering producing self-fluxing iron ore pellets at the Carol Project in Labrador City. To assess the two areas, nine holes were drilled using a portable 'Winkie' drill owned and operated by Labrador Mining and Exploration Company Ltd.

The first dolomite prospect, Javelin Road South, is 7 km east of I.O.C.'s pellet plant and adjacent to a small dirt road which branches off the south end of the Javelin Road (Figure 1). Drillhole #1, at the site of a 1985 bulk sample, intersected clean, white, coarsely crystalline marble very similar to that exposed at the surface. The small amount of impurities observed in the drillcore (1 to 3 percent) consists of light brown to clear patches of tremolite up to 3 mm in diameter, laminations of pale green tremolite 1 to 4 mm thick, rare quartz laminations and lenses 1 to 3 mm thick, and very small amounts of finely disseminated pyrite with lesser chalcopyrite. The latter is typically associated with the tremolite or quartz laminations. The drillhole intersects a 12 cm wide, greenish gray gabbro band at 11 metres and ends in similar rock at 21 metres. These gabbro units are thought to be sills/veins of Shabogamo gabbro, which outcrops 1 km

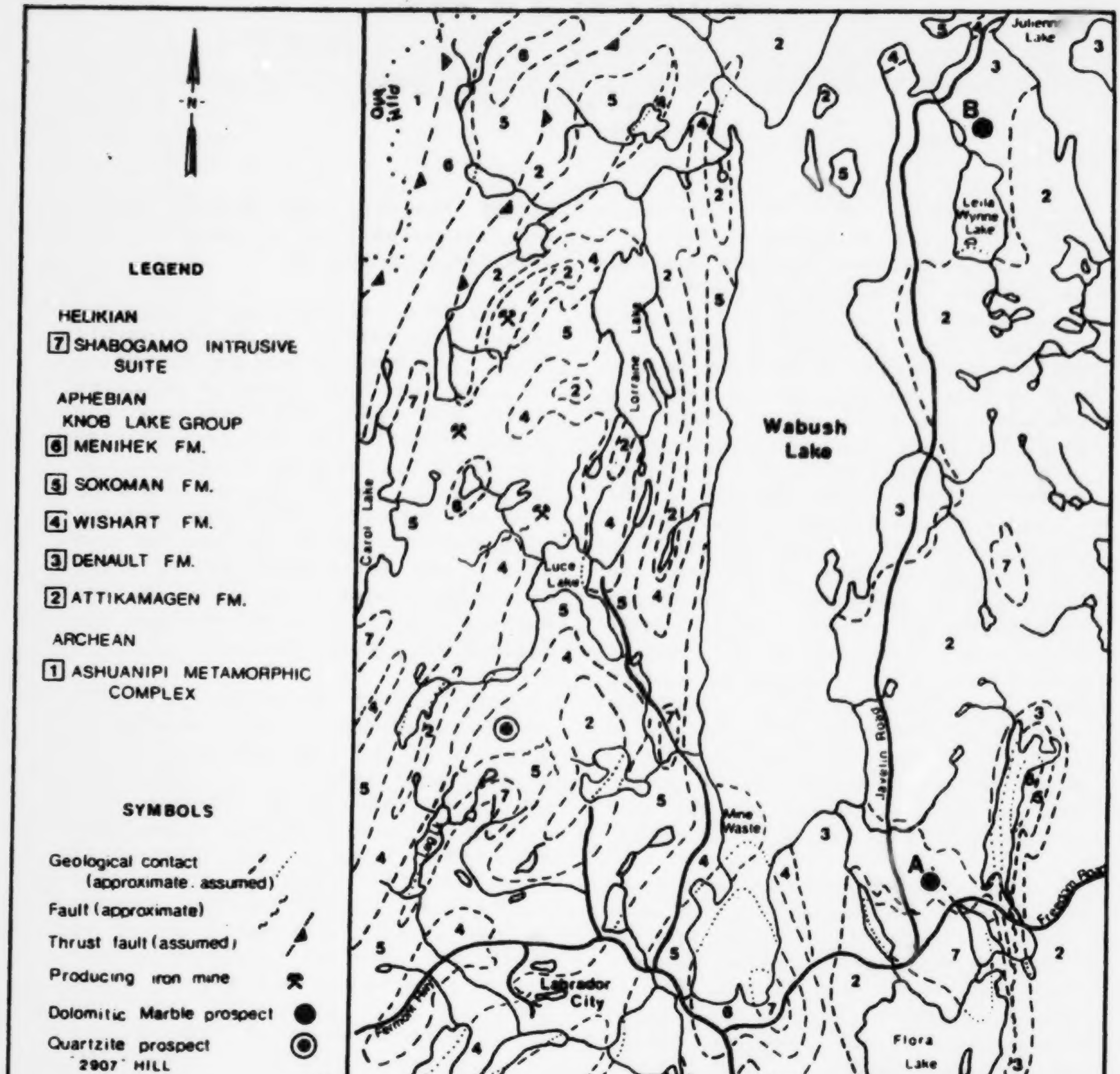

N
LEGEND
HELIKIAN
7 SHABOGAMO INTRUSIVE SUITE
APHEBIAN
KNOB LAKE GROUP
6 MENIHEK FM.
5 SOKOMAN FM.
4 WISHART FM.
3 DENAULT FM.
2 ATTIKAMAGEN FM.
ARCHEAN
1 ASHUANIPI METAMORPHIC COMPLEX
SYMBOLS
Geological contact (approximate, assumed)
Fault (approximate)
Thrust fault (assumed)
Producing iron mine
Dolomitic Marble prospect
Quartzite prospect "2907" HILL
JAVELIN ROAD SOUTH DDH 1,2,3,4,5
A
LEILA WYNNE LAKE DDH 7,8,9
B
Geology after T Rivers 1980 a,b
Scale
0
1
2
3km
Wabush Lake
Labrador City
Wabush
Luce Lake
Lorraine Lake
Carol Lake
Leila Wynne Lake
Julienne Lake
Flora Lake
Duley Lake
Elephant Head Lake
Mine Waste
Javelin Road
Fermont Road
jrm

Figure 1: Geology and Location of Drillholes in Western Labrador

to the south. The dolomitic marble may continue below the gabbro.

Three more holes ranging from 25 to 37 m in depth were drilled 150 to 400 m northeast of drill hole #1. They intersected light gray to white, dolomitic marble which is generally banded and locally iron stained. There are more common and thicker tremolite and quartz laminations, lenses, and patches, averaging 3 to 8 percent over the total length of the holes. These holes are to the northeast and across the regional strike from hole #1.

The second prospect drilled is 1.5 km southeast of the north end of the Javelin Road and 700 m north of Leila Wynne Lake. Three holes were drilled in this area, which has extensive outcrops of dolomitic marble. Hole #7 was drilled at the site of last year's encouraging bulk sample, but it contained over 10 percent quartz, tremolite and pyrite. Hole #8, drilled 70 m northeast, consists of much cleaner, whiter, coarsely crystalline, dolomitic marble. Hole #9, drilled 150 m northwest of the previous one, intersected 25 m of extremely white, medium to coarsely crystalline, dolomitic marble. Drill core from Hole #9 contains minor, widely spaced, faint gray bands, indicating the presence of trace amounts of very finely disseminated pyrite, rare 1 to 3 mm quartz laminations and light brown patches of tremolite 1 to 5 mm in diameter. The dolomitic marble in this hole equals the purity and consistency of that from Hole #1 at the Javelin Road South prospect, and there is potential for large reserves of high quality dolomitic marble in this area. Drill core from all of the holes is currently being analyzed for major elements.

The 1984 industrial mineral survey confirmed the presence of significant amounts of high quality silica very close to Labrador City and Iron Ore Company of Canada's open pit operation. The best of many prospects was "2907 Hill", a rounded hill of massive Wishart Quartzite 4 km south of the Smallwood pit (Figure 1). This single exposure represents approximately 200 million tonnes of silica. The geochemical analyses presented below indicate the purity of this silica resource. The analyses represent an average of 20 chip samples collected from a traverse across the top of 2907 Hill, each sample representing a 10 metre interval:

SiO_2 - 99.90%
Al_2O_3 - 0.0945
Fe_{tot} - 0.0635
MgO - 0.0135
CaO - 0.0135
Na_2O - 0.01

K_2O - 0.016
TiO_2 - 0.011
MnO - 0.01
P_2O_5 - 0.0175
LOI - 0.291

SiO_2 (calculated) - 99.77

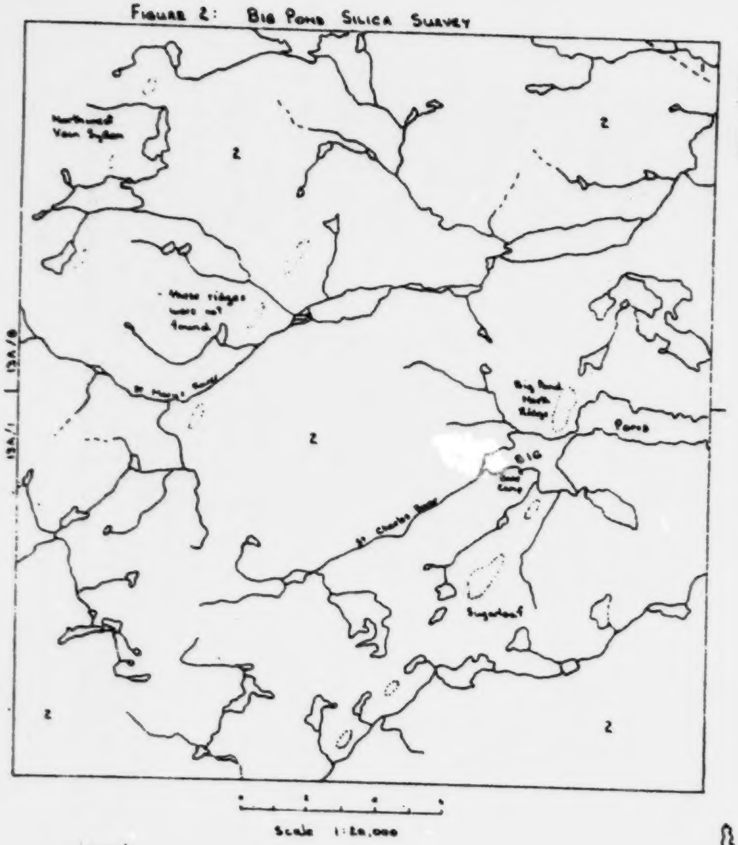
Additional sampling was conducted on "2907 Hill" in 1985 and further tests are being done.

Big Pond Silica

Large quartz and quartz-feldspar veins occur in massive to poorly foliated granite/granodiorite of Neohelikian (or earlier) age in an area 20 to 35 km west to southwest of Mary's Harbour. These veins were originally mapped by K.E. Eade of the Geological Survey of Canada in 1961, and examined by Brinco in 1982. A silica survey, consisting of a one week detailed sampling program, was carried out this past field season and concentrated on the most easterly of three parallel, northeast trending, vein systems.

The southeast vein system consists of five individual ridges spaced up to 2 km apart in a north-northeast trending line (Figure 2). They are up to 1500 m long, 400 m wide, with a maximum of 150 m relief and are generally very steep sided.

Figure 2: Big Pond Silica Survey


N
Northwest Van Sylan
2
These ridges were not found
13A/8
13A/1
St. Mary's Gulf
Big Pond North Ridge
Pond
BIG
St. Charles Road
Sugarloaf
Scale 1:20,000

Legend
Archean
quartz - feldspar veins
2 - granite to granodiorite, massive to poorly foliated
1 - granitic and banded gneiss

Geology by K.E. Eade, 1961

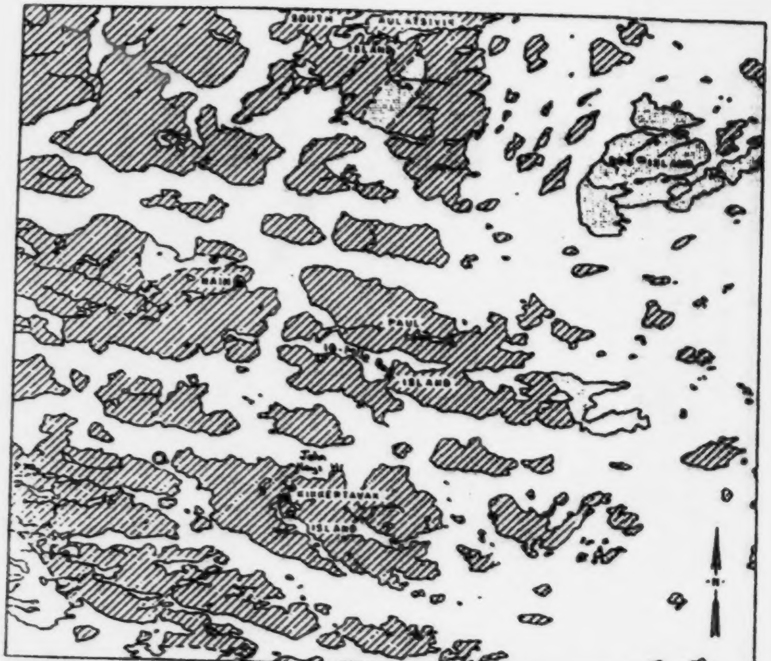
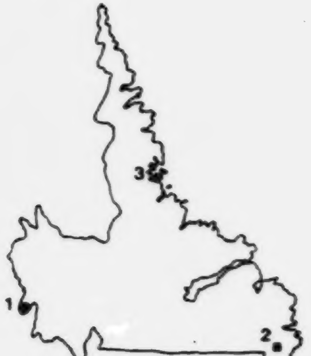

SOUTH AULATSIVIK ISLAND
NAIN
PAUL ISLAND
KIGERTAVAK ISLAND
N

Figure 3: Dimension Stone Localities

□ Anorthosite outcrops with potential for dimension stone
● Labradorite Occurrence
● Grenfell Quarry (Tabor Island)
▨ Nain Anorthosite
☐ Non Anorthositic rocks (mainly adamellite)

Scale
Kilometers 0 10 20 Kilometers



Location map for 1985 Industrial Mineral Projects in Labrador

The ridges are composed of quartz-feldspar veins which contain evidence of multiple intrusion. There are breccias and mylonites within these vein systems (which Eade (1962) related to strong shearing) and the latter are commonly stained red with hematite. Gas brecciation features and low temperature feldspars (adularia) were also observed, suggesting the possibility of hydrothermal systems with the potential for precious metals.

The two largest ridges within the southeast vein system are Sugarloaf and Big Pond North Ridge, with Sugarloaf being the best silica prospect. The Sugarloaf ridge contains 10 to 15 percent "pure" quartz veins which form a 5 to 30 m wide zone running the entire length of its southeastern side; locally 0.5 to 1.5 m wide quartz lenses occur within the quartz-feldspar zones.

This survey was carried out in a similar fashion to previous sampling programs. Numerous short traverses were run across the ridgetops, perpendicular to strike, collecting rock ship samples at 10 to 15 m intervals, depending on the degree of exposure. One hundred and forty-four samples were collected from the southeastern vein system, and ten samples were collected from reconnaissance sampling of the northwest vein system. The middle vein system has no observable topographic expression and was not located in this survey.

Goose Bay and Nain Anorthosite

The Goose Bay and Nain anorthosite complexes were investigated for their industrial mineral potential. The Goose Bay complex was studied as a potential source of alumina and both complexes were assessed for their dimension stone potential.

Grab samples obtained in 1984 indicate the Goose Bay anorthosite complex contains up to 27 percent Al_2O_3. If large areas of anorthosite with this grade could be proven, it would be a viable source of alumina for use in the ceramics industry. However, in our survey of road and hillside outcrops in the Goose Bay - Northwest River area, the anorthosite contains 2 to 10 percent coarsely crystalline pyroxene and ilmenite. This lowers the average AL_2O_3 content and limits the alumina potential of these rocks. These impurities also detract from the dimension stone potential of the anorthosite because they take away from the aesthetic appearance and consistency of the stone; they also oxidize and stain polished surfaces. Furthermore, the outcrops are cut by closely spaced joint and fracture systems which prevent the extraction of large blocks, and the 1 to 3 cm long feldspar crystals within the rock are commonly cut by annealed fractures that now appear as irregular, 1 to 2 mm wide, wavy white lines.

The Nain anorthosite complex was also investigated to assess its dimension stone potential. The well known localities with gem quality labradorite, which were reported by Watson (1980), were briefly assessed at Tabor Island, Pearly Gates and John Hay's Harbour. These are generally extremely coarse grained, pegmatitic pods that are too limited in size or too fractured to be able to quarry in large uniform blocks.

Three other localities of massive, more homogenous, fine to coarsely crystalline (0.5 to 4.0 cm crystals) anorthosite were visited and these have much better dimension stone potential (Figure 3).

A large area of very massive anorthosite rises steeply, 75 to 100 m, from the ocean at Ten Mile Bay. In the early sixties, Brinex and an independent granite producer from Quebec extracted several tonnes of stone at this site. Quarrying was extremely difficult on the steep slope, and the medium grained anorthosite (0.5 to 1.5 cm crystals) contains pyroxene-biotite foliations and thin white lineations (1 to 3 mm wide) that detract from its overall appearance.

Massive, gently sloping outcrops of anorthosite occur on the east side of Igiak Bay and, to the north, in the 'saddle' between Igiak Bay and John Hay's Harbour. The anorthosite is coarse grained (1.0 to 4.0 cm crystals) and contains minor mafic minerals, and it is free of any white lineations. There is a uniform distribution of rich, dark blue to blue-green chatoyant crystals and the rock has a relatively consistent appearance. There is a distinct lack of vertical jointing and fracturing at the Igiak Bay locality, whereas in the 'saddle' locality a vertical fracture/joint system is well developed. Both areas appear to have enough horizontal jointing to be good potential sites for the quarrying of large anorthosite blocks. These would be suitable for use as high quality chatoyant dimension stone similar to the Scandinavian "blue pearl".

This dimension stone assessment was carried out with the help of S. Nantel of the Ministere de l'Energie et des Ressources de Quebec.

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METALLOGENY OF PERALKALINE ROCKS IN LABRADOR: STRANGE LAKE PERALKALINE GRANITE AND LETITIA LAKE (MANN #1) SHOWING

by

R.R. Miller
Mineral Deposits Section

Introduction

The Strange Lake deposit (Zr-Y-Nb-Be-REE) and the showings in the Letitia Lake area (Mann #1 Nb-Be) contain potentially significant amounts of important rare metals which are used in the "high tech" manufacturing sector (e.g. electronics, computer components, defense materials, and ceramics). It is the aim of this project to document the economic geology of these deposits and to determine their genesis. This work is considered essential to the successful development and/or evaluation of these deposits, and the determination of exploration parameters to aid in the discovery of similar deposits in Labrador. The future of rare metal use in industry appears to be very good due in part to its connection with "high tech" applications.

The Strange Lake Deposit is located above the tree-line, 150 km west of Nain and the Labrador coast, and 250 km northeast of Schefferville, Quebec (Figure 1). The Letitia Lake area is located below the tree-line, 160 km northwest of Goose Bay, and 50 m east of the Smallwood Reservoir (Figure 1).

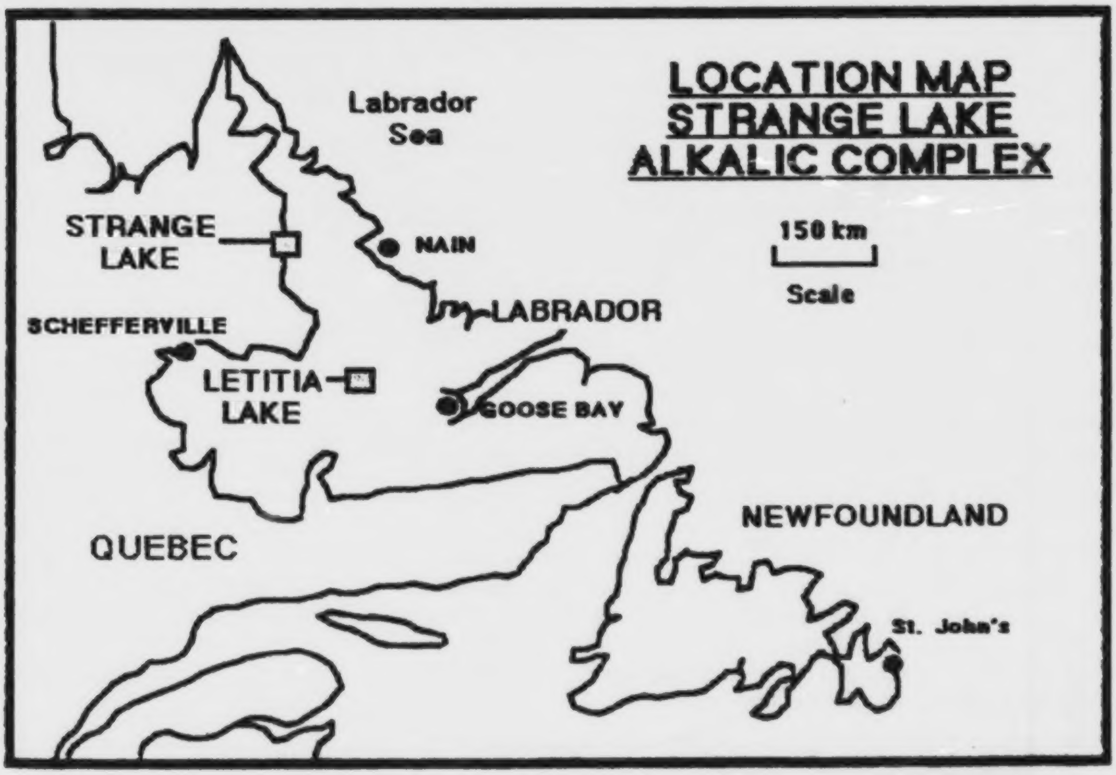
LOCATION MAP
STRANGE LAKE
ALKALIC COMPLEX
Labrador Sea
STRANGE LAKE
NAIN
LABRADOR
SCHEFFERVILLE
LETITIA LAKE
GOOSE BAY
150 km
Scale
NEWFOUNDLAND
QUEBEC
St. John's

FIGURE 1

Strange Lake Peralkaline Granite

The Strange Lake Peralkaline Granite was visited for a short period of time during the summer field season to complete the collection of geochemistry and petrographic samples, and to complete the detailed mapping of the complex on a 1:10,000 scale.

Figure 2 is a sketch map of the major geological units observed in this complex (Zajac et al., 1984; and the author's 1985 field work). All three major intrusive units observed within the complex are peralkaline granites, which consist of quartz, feldspar (microperthite, or albite + k-spar), riebeckite and/or aegirine, and various exotic* minerals. Each unit can be differentiated by the exotic mineral contents:

Exotic-poor - 5%
Exotic - 5%, 15%
Exotic-rich - 20%

The detailed mapping has helped to define the relationships between the younger, exotic-rich mineralized granite and the older, less mineralized exotic and exotic-poor phases. This work indicates that the mineralized zones occur at or near the contact between the exotic and exotic-poor phases.

Letitia Lake Rare Metal Showings

Five weeks were spent in the Letitia Lake area to sample and map the Mann #1 showing and to visit some of the lesser known showings. A helicopter-borne spectrometer survey was also carried out over the Letitia Lake area to help locate other Mann #1-type showings.

The Mann #1 showing was mapped on a scale of 1:580 and the vicinity was mapped on a scale of 1:2,320. These two regions are outlined on the geology sketch map of the Letitia Lake area (Figure 3). Representative lithogeochemistry and petrographic samples were collected from each map area for future laboratory analysis.

Results from the spectrometer survey (total counts) will be released at a later date along with the results of a later ground check of significant radiometric anomalies. Correlation of survey results indicate that the Mann #1-type showing has above background radioactivity, although not all radiometric anomalies can be attributed to this type of mineralization. Previously described showings in the area (Figure 3; see Mineral Inventory Files for details) were clearly indicated by the survey. These include:

Mann #1 Showing	^Be 001
Michelin Prospect	^Nb 001
Mann #2 Showing	^Nb 002
Two Tom Lake Showing	^Ree 001

Mapping of the rocks associated with all four previously known showings indicates that peralkaline syenites are the main rock type associated with the mineralization. Five centres of peralkaline syenite ± granite have been identified in the area; four have associated mineralization at or near their margins.

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* EXOTIC MINERALS - all unusual, rare and unknown minerals which are enriched in incompatible elements ... at Strange Lake this includes the following: gittinsite, elpidite, fluorite, astrophyllite, pyrochlore, gadolinite(?), thorite, zircon, armstrongite, narsusakite, sphene, aenigmatite, gagarinite, allanite and monazite.

^ Mineral Inventory File numbers for NTS 13L/1 (1:50,000 sheet).

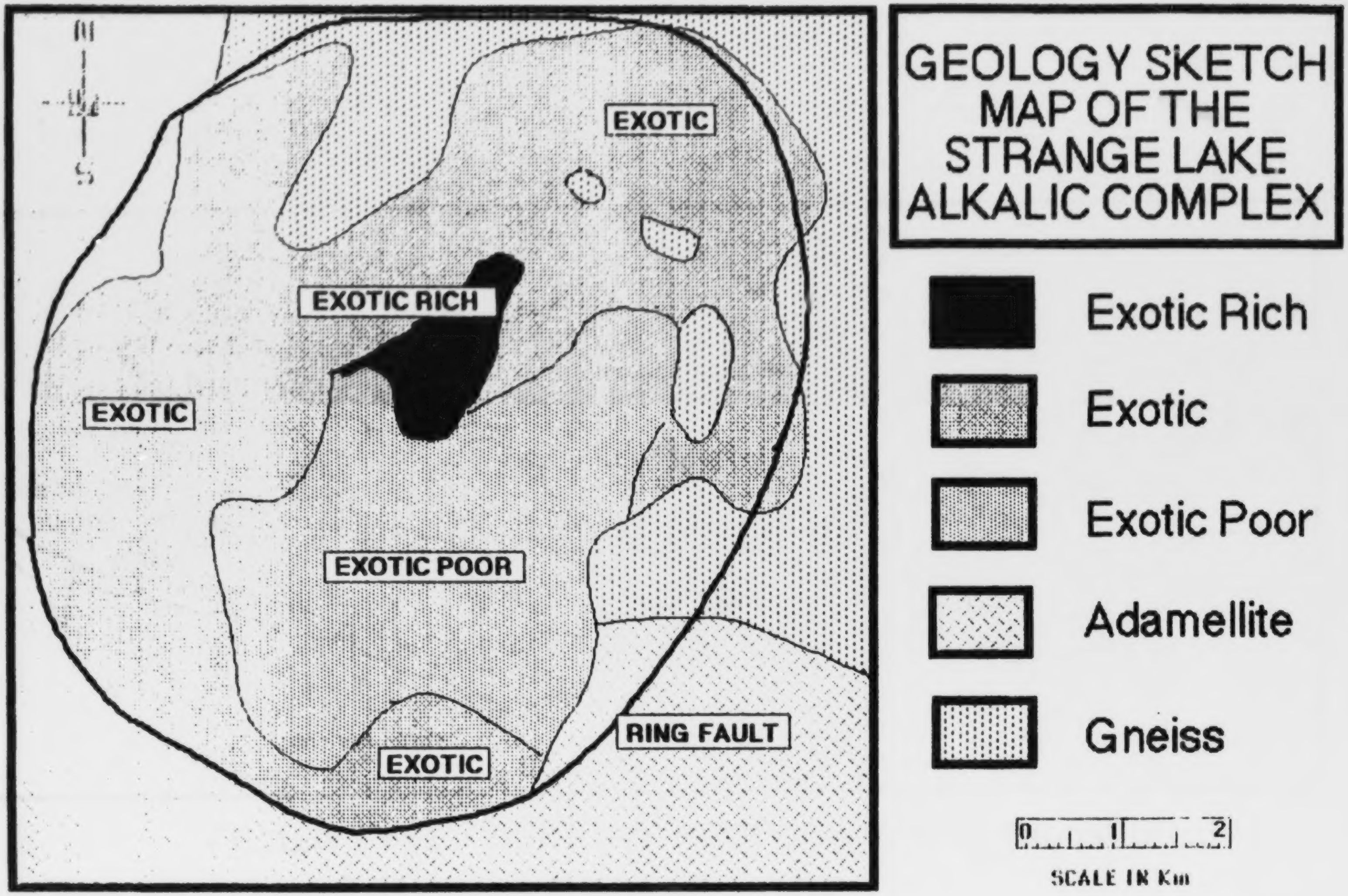
GEOLOGY SKETCH MAP OF THE STRANGE LAKE ALKALIC COMPLEX
Exotic Rich
Exotic
Exotic Poor
Adamellite
Gneiss
0
1
2
SCALE IN Km
N
S
EXOTIC
EXOTIC RICH
EXOTIC
EXOTIC POOR
EXOTIC
RING FAULT

FIGURE 2

LETITIA LAKE - GENERAL GEOLOGY AND SHOWINGS

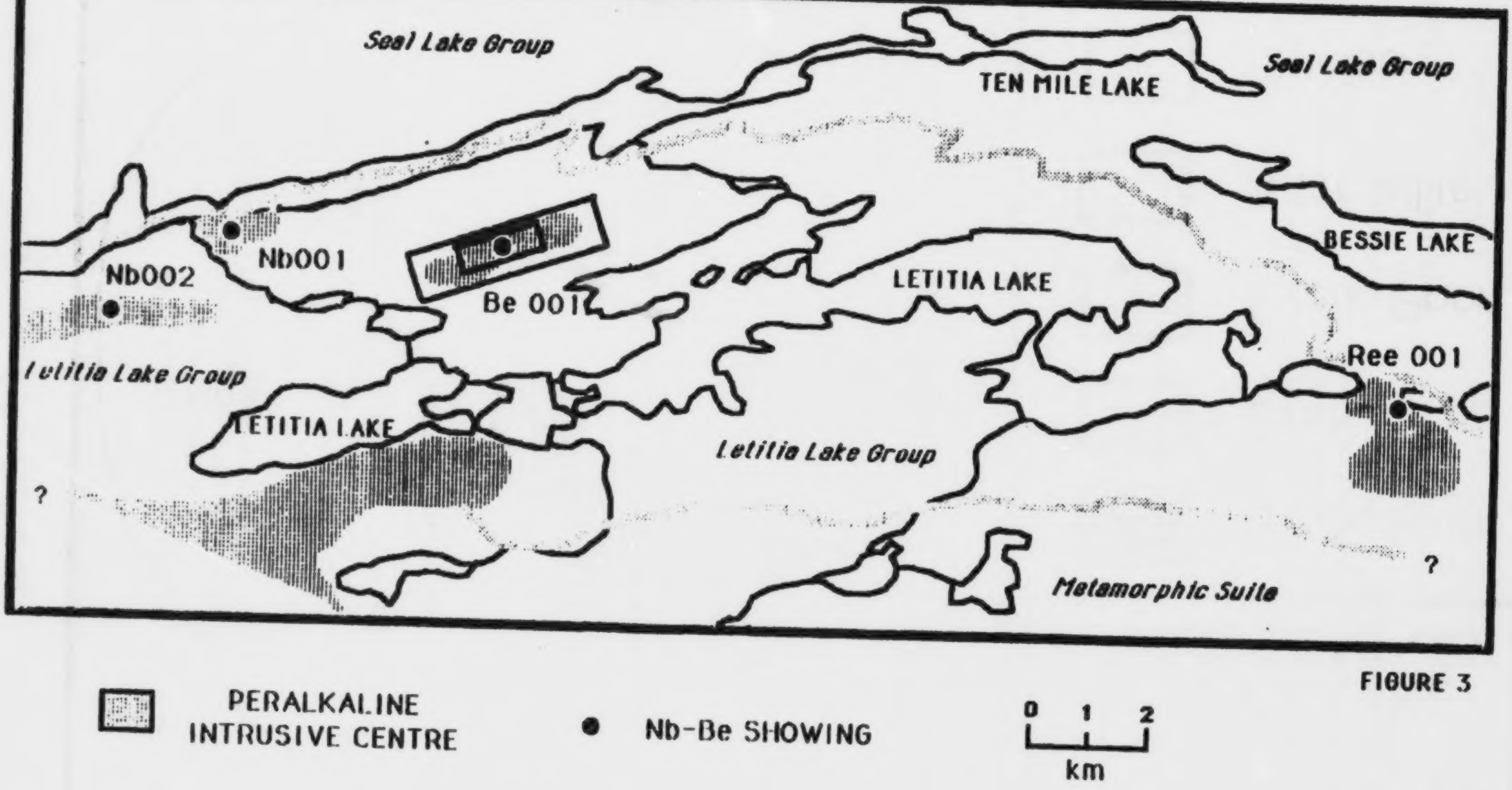
Seal Lake Group
Seal Lake Group
TEN MILE LAKE
BESSIE LAKE
LETITIA LAKE
Nb001
Nb002
Be 001
Ree 001
Letitia Lake Group
LETITIA LAKE
Letitia Lake Group
?
?
Metamorphic Suite
PERALKALINE INTRUSIVE CENTRE
Nb-Be SHOWING
0
1
2
km

FIGURE 3

Preliminary conclusions are that some or all of these five intrusive centres were the focus of the volcanic activity which resulted in the Letitia Lake Group peralkaline volcanics; previous work suggests that all peralkaline rocks in the vicinity are coeval (Thomas, 1981; Hill and Thomas, 1983). The four mineralized peralkaline centres are in the upper part of the Letitia Lake volcanic sequence near the contact with the younger Seal Lake Group.

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METALLOGENY OF PORTIONS OF THE CENTRAL MINERAL BELT, LABRADOR

by

D.H.C. Wilton, C.S. MacDougall, and L.M. MacKenzie
Department of Earth Sciences, Memorial University of Newfoundland

Introduction

Field work completed during the summer of 1985 involved examination and sampling of mineral showings in the Upper Aillik, Moran Lake and Bruce River groups, and various granitoids within the Central Mineral Belt (CMB) of Labrador (see Figure 1). An initial sampling program was completed during the summer of 1984 in these same lithologic units, including the Lower Aillik Group; preliminary results of that study have been reported by Wardle and Wilton (1985). This summer detailed studies were undertaken by MacDougall (as the basis for M.Sc. thesis work) in the Round Pond area and by MacKenzie in the Burnt Lake region. For more detailed information on the regional geology, locations and specific occurrences see Bailey (1979), Gandhi (1978), Gower et al. (1982) and Ryan (1984).

General Program

The following are general observations on the showings studied during the past field season:

Molybdenum: The Upper Aillik Group on the Cape Makkovik Peninsula contains well known and delineated (Piloski, 1960) concentrations of molybdenum known as the Aillik Bay Molybdenite Showings. The showings consist of pyrite-molybdenite stringer and stockwork zones (3.5 mm in thickness), cutting rusty weathering, white, recrystallized ("sugary"), felsic metavolcanic rocks. The sulfides are associated with quartz and minor fluorite, and are subparallel to cross-cutting with respect to the host rock fabric. Other showings in the vicinity of the main zone are uraniferous, e.g., the Sunil Showing.

A similar style, i.e., pyrite-molybdenite stringers, of mineralization occurs at the LM12 showing on the Cape Strawberry Peninsula, approximately 400 m south of the contact between the Aillik Group and the Strawberry granite. Scattered throughout the Upper Aillik Group on this and the Makkovik Peninsulas are rusty weathering zones with disseminated pyrite and rare molybdenite flakes. Near the Strawberry granite contact on the eastern shore of Wild Bight, pegmatite dikes (of this granite?) containing disseminated molybdenite cut the Aillik Group, which exhibits rusty weathering in the contact zones. At showing LM13, approximately 2 km southwest of LM12, red aplite float found in a stream bed contains molybdenite layers up to 5 mm thick.

Near Tom's Cove on the southern end of the Cape Makkovik Peninsula there is a skarnoid developed in amphibolites of the Upper Aillik Group. This showing consists of zoned veins of pyroxene, garnet and molybdenite with carbonate cores.

As a general conclusion it appears that the molybdenite mineralization formed from hydrothermal-magmatic fluids of probable granitic derivation.

Lead-Zinc: The Upper Aillik group contains galena (+ Ag values) and sphalerite-bearing carbonate veins at the Big Bight showing (veins

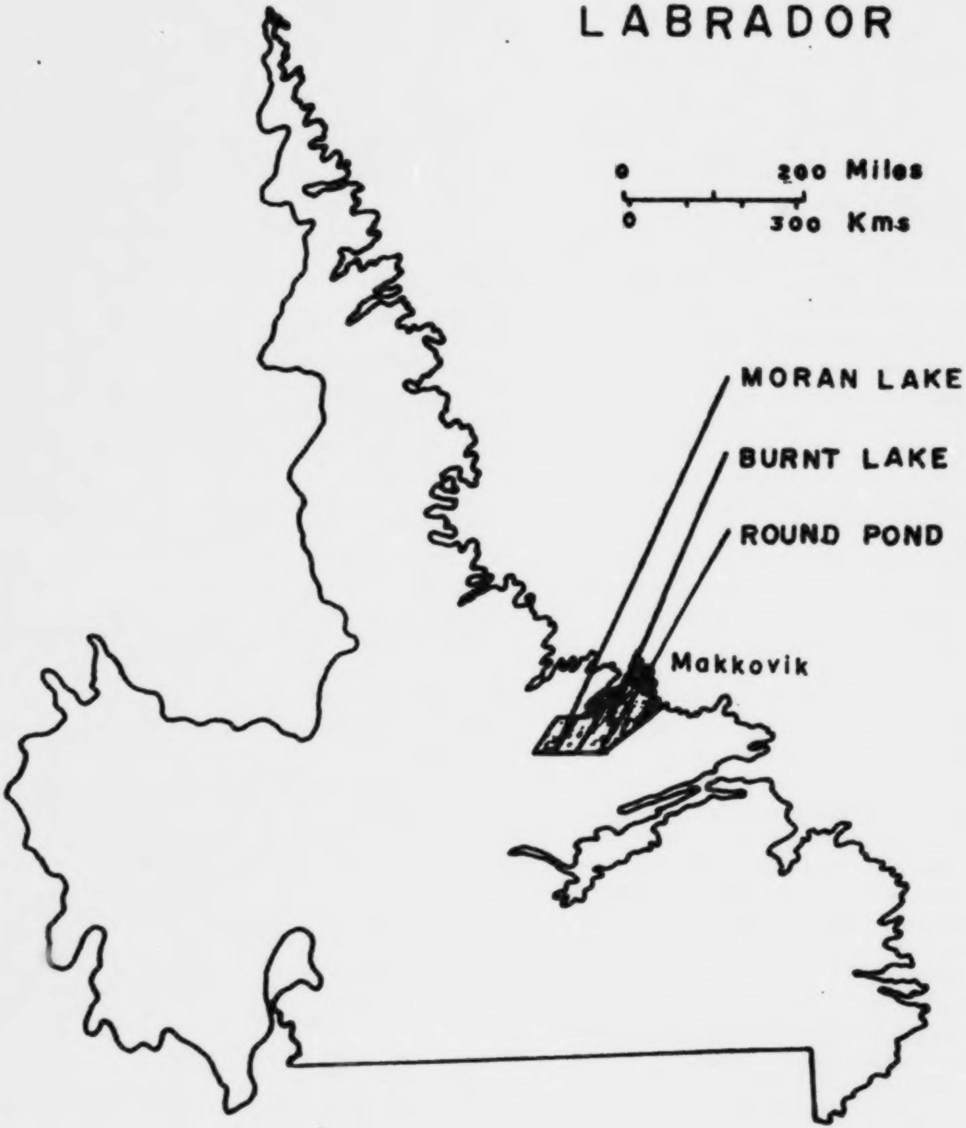
LABRADOR
0
200 Miles
0
300 Kms
MORAN LAKE
BURNT LAKE
ROUND POND
Makkovik

Figure 1: ▨ Central Mineral Belt, area covered 1985

up to 30 cm thick), and along the western shore of Ford's Bight. There is further lead mineralization in this unit at Mink Trap Brook, just south of Makkovik, where skarnoid veins, consisting of huge zoned garnets (crystals up to 10 cm in diameter), pyroxenes, carbonate, chalcocite(?) and galena, occur in amphibolite. Felsic metavolcanic rocks in contact with this amphibolite are cut by barren, anastomosing carbonate veins.

The Warren Creek Formation of the Moran Lake Group, a dominantly black shale unit (Ryan, 1984), contains various (but similar) galena-sphalerite vein systems. Among those investigated in this study are:

1) galena-bearing quartz veins in the basal dolostone member of this unit north of Moran Lake.

2) galena-sphalerite bearing carbonate and barite veins of the Ellingwood showing north of Moran Lake.

3) quartz-carbonate veins with galena and sphalerite at the Green Pond showings.

4) galena-sphalerite-chalcopyrite-bearing quartz veins in basement granite at the unconformable contact with the Warren Creek Formation, approximately 35 km northeast of Moran Lake.

The only lead occurrence examined in the Bruce River Group was the Ferguson Lake Lead showing. This showing consists of galena in carbonate veins with associated fluorite and quartz-feldspar zones (pegmatitic ?) transecting Heggert Lake Formation sandstones.

Uranium: The Upper Aillik Group is host to a number of different uranium occurrences ranging from indications to deposits such as the Michelin. In the region from Cape Makkovik to Round Pond, uranium (pitchblende and uraniferous amphiboles) occurs as fracture-fillings associated with fluorite, pyrite, molybdenite and andraditic garnets. Those included in the sampling program are the Aillik, Sunil, John Michelin, A-7 and Black Hat showings.

The first (circa 1954-1957) uranium showings found in the Central Mineral Belt occur in the area between Pitch Lake and Bernard Lake (Piloski, 1955). These small showings contain some of the richest uranium mineralization found in the Upper Aillik Group. At the number 1 and 2 (or Pitch Lake) showings, thin seams of pitchblende, intergrown with specular hematite, transect both the Monkey Hill granite and amphibolite xenoliths.

The number 5 and 22 showings, and a small trenched zone northeast of the number 7 showing, consist of strongly hematized felsic metavolcanic or volcanic sedimentary rocks containing pitchblende fracture-fillings. The host rocks are infolded with a peculiar gray-black, biotite--bearing, amphibolite that contains carbonate-filled vugs. The presence of the amphibolite appears to be an ore control for uranium deposition. Minor malachite staining is associated with the number 5 showing.

At the number 7 and 11 showings (11 is actually part of 7), west of Bernard Lake, folded seams of pitchblende occur within felsic metavolcanic rocks and infolded amphibolite dikes of the Upper Aillik Group. Pitchblende also occurs as clots up to 1.5 cm in diameter associated with discrete zones of intergrown pyroxene, biotite and carbonate cores. Associated with the pitchblende zones are folded layers of a black, massive, "crumbly" mineral (according to Beavan (1958) this mineral is stromeyerite) which has intense malachite and azurite staining.

The relatively undeformed Upper Aillik Group in the Michelin-Burnt Lake-Emben region contains numerous showings in which the uranium is associated with amphibole-rich layers or disseminations in the host rock (Kontak, 1980).

The Joe Pond Formation, a mafic pillow lava unit which is the upper member of the Moran Lake Group (Ryan, 1984), contains several small uraniferous fracture-fillings. In the showing north of Moran Lake, bornite, malachite and carbonate-filled fractures also occur within highly sheared and faulted host rock. Near Duck Lake, a cherty iron formation (the top of this member) is unconformably overlain by the Bruce River Group. A 1 to 2 cm wide pitchblende seam occurs in the iron formation but is not present in the overlying Bruce River Group sedimentary rocks.

The Bruce River Group is host to a number of uranium showings. In the basal sedimentary units of this group, the showings occur as fracture-fillings in conglomerate (Moran 'A'), sandstone (Moran 'B' and Duck Lake), and conglomerate with chalcopyrite and bornite (Brown Lake). Enigmatic uranium mineralization is associated with intense carbonatization at the Moran 'C' showing. Host rocks at this showing seem to be tuffisitic breccias of the Heggart Lake Formation, although some of the brecciation may be, in part, a ductile mechanical (i.e. mylonitic) phenomenon.

Felsic volcanic members in stratigraphically higher portions of the Bruce River Group are host to small uranium showings, as shear zones in the case of the Madsen showings, and as spherulitic interlayers in the Syliva Lake showings.

Precious Metal: The gold and gold-silver-bearing vein systems, at Pomiadluk Point and Big Bight respectively, were mapped in more detail. Also, rusty pyritic zones within the Upper Aillik Group in the Makkovik-Ford's Bight area and rusty sulfide-bearing veins in the Cape Makkovik area were sampled for analysis for their precious metal contents.

Round Pond

Round Pond is located approximately 4 km south-southeast of Makkovik and the study area encompasses approximately 70 km^2. The present investigation involves a detailed study of base metal sulfide-Mo-U-F mineralization in felsic volcanic rocks of the Upper Aillik Group. Particular attention has been given to the relationships between the ore mineralization and associated host rocks with the nearby, apparently posttectonic, Monkey Hill granite.

Field mapping and sample collection completed this past summer have revealed that there are primarily five types of mineralization:

1) Disseminated pyrite, and rare molybdenite and fluorite, within the Monkey Hill Granite and associated pegmatites.

2) Disseminated pyrite, and molybdenite in veins, within or at the contacts with amphibolite dikes.

3) Disseminated pyrite, molybdenite and fluorite within gossan zones in felsic tuffs and volcanic conglomerate.

4) Hydrothermal veins of Cu-Mo-F-U in altered felsic tuffs and volcanic conglomerates.

5) Disseminated molybdenite as an apparent stockwork cutting amphibolites.

Further work will be carried out next year at the research facilities of Memorial University and will involve a petrological study and an extensive geochemical investigation of the ore minerals and host rocks.

Burnt Lake

The Burnt Lake area is approximately 30 km south of the community of Postville. The area mapped is 80 km^2 and is bounded to the north by Maclean Lake and to the south by Burnt Lake. The region is underlain by the felsic volcanic and clastic sedimentary rocks of the Upper Aillik Group. The volcanic rocks were intruded by a high level plutonic sequence ranging in composition from leucogranite to granite. Both the Aillik Group and granites are cut by metadiorite and metadiabase dikes, and finally by the coarse grained Michael Gabbro.

Uranium mineralization is hosted by the felsic volcanic rocks which consist of porphyries, crystal tuffs, massive tuffaceous sediments and minor breccias. A typical feature of the host rock is a dark reddish (hematite) alteration and an increase in the mafic (amphibole ?) content of the rock.

The uranium mineralization is hosted by a variety of rock types with varying porosities and permeabilities, therefore ore deposition was probably a result of chemical parameters rather than physical ones. The uraniferous ore-forming solutions may have originated as hydrothermal fluids in the felsic volcanic sequences which then moved through the piles leaching (and thus concentrating) uranium. Another potential source is late stage magmatic - hydrothermal fluids derived from the granitic magmas, which may have been partially coeval with the felsic volcanism. Other mineralization hosted in the felsic volcanic rocks consists of pyrite, with minor chalcopyrite, galena, fluorite and molybdenite.

There are several showings of molybdenite pods and disseminations within the granite near the felsic volcanic contact. This mineralization was produced by late stage magmatic fluids.

Further Work

A follow-up laboratory study of the samples collected from the Central Mineral Belt will involve a full range of geochemical analyses (majors and traces) on mineralization, host rocks and country rocks; with precious metal and REE analyses on more important samples. A broad scale U/Pb (and Sm/Nd) dating program will be carried out on pitchblende and other uraniferous minerals. Pb/Pb isotope data will be collected from all galena samples available from the Central Mineral Belt. Re/Os dating of molybdenites will also be attempted.

Acknowledgements

Financial support for these projects was provided by the Geological Survey of Canada through the 1985 ERDA Agreement II-2, Metallogeny of the Central Mineral Belt, and by NSERC Northern Supplement Grant No. N0153. The projects could not have been accomplished without the logistical assistance provided by the Newfoundland Department of Mines and Energy through Dr. R.J. Wardle and Mr.'s W. Tuttle, K. O'Quinn and A. Kerr. Fruitful discussions have been held with T. Birkett, S.S. Gandhi, A. Kerr, B. Ryan and R.J. Wardle. Special thanks must go to our field assistants, Lorne Fiander and Cyril Pumphrey, for "bearing" with us.

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RESOURCE ASSESSMENT, WESTERN LABRADOR

by

Tyson Birkett
Geological Survey of Canada

Objectives

1. Describe and sample known mineral occurrences
2. Describe and sample igneous rock sequences
3. Evaluate precious metal potential in the study area
4. Suggest exploration concepts based on lithology and tectonic history

Field work was carried out in seven areas of Labrador during the 1985 field season. It involved mapping and sampling of base-metal showings, and mapping and sampling of representative sections of the major volcanic sequences. Sample preparation and analysis and descriptive metallogeny of the region are in progress.

Some Preliminary Suggestions

Carbonatites with potential for rare metal mineralization may be localized where East-West basement structures intersect the Labrador Trough, as well as along East-West structures in the Archean basement.

Major shale basins, e.g., Martin Lake Area, have potential for exhalative Pb-Zn. There is potential for precious metals near major gabbroic sills, e.g., Howse Lake-Marion Lake areas, and associated with pyritic, siliceous dikes,e.g., Dyke Lake Area.

MARBLE ASSESSMENT - INSULAR NEWFOUNDLAND

by

Ambrose Howse
Mineral Deposits Section

An assessment of Newfoundland's marble deposits was initiated in 1985. The project's aim is to determine their potential value for such industrial applications as fillers, extenders, whiteners, and dimension stone. Deposits were investigated in three areas with good potential for hosting high purity white marbles. Detailed sampling was carried out for chemical and physical testing.

Western White Bay

A number of marble deposits in the Sops Arm - Jacksons Arm area were investigated. These are part of the Cambro-Ordovician Coney Arm Group. Typical of these deposits, in the southern part of the group, is the exposure of gray to pink marble which occurs in a gravel quarry on the north bank of the Main River. The marble is a fine grained, cream colored breccia containing a network of slender, wavy, reddish brown and orange calcite veins. The latter are so numerous that they impart a pale orange-brown color to the deposit. This stone may have potential for making terrazzo chips, as suggested by Goudge (1977). Similar occurrences were examined just west of the highway between Sops Arm and Jacksons Arm.

The recrystallized limestone deposits exposed along the shoreline between Little Coney Arm and Big Coney Arm were sampled in detail. Although generally the stone is too dark in color for use as filler, there are large reserves of high purity stone available for a potential cement industry. The construction of the Cat Arm Access Road has greatly improved access to this resource.

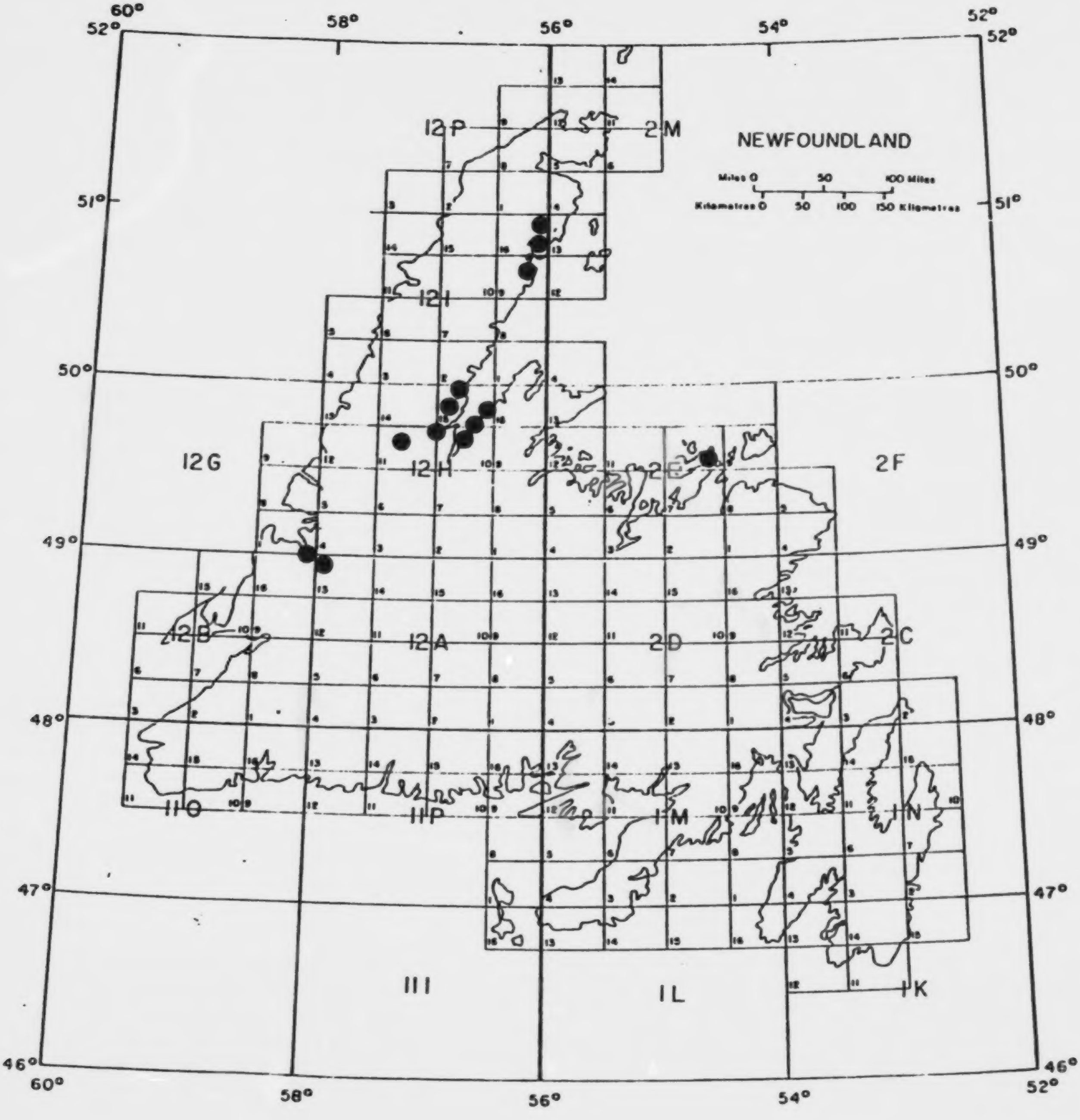
Eastern White Bay

Marble deposits were investigated at Purbecks Cove, Clay Cove and Bear Cove on the western coast of the Baie Verte Peninsula. All are part of the Eocambrian White Bay Group metasedimentary rocks (Hibbard 1983).

The white marble at Purbecks Cove forms a cliff overlooking the north side of the community. It is highly fractured and broken by cross-cutting joints and there is great variation in texture, from extremely fine grained to coarsely crystalline, over short distances on an outcrop scale and locally within hand specimens. The exact size of the deposit is unknown because of structural complications and lack of exposure at the top of the hill. Nevertheless, it was possible to measure a strike (040°) length of 225 m of continuous marble, and an average outcrop width of 9 m. Bain (1937) considered the marble to be unsuitable for building and ornamental stone because of the severe jointing. However the marble may have potential as a filler and whitener.

Clay Cove

A deposit of white marble at Clay Cove, an isolated indentation in the coastline about 6 km south of Purbecks Cove, was worked on a small scale in the late 1920's. The marble is grayish white to white with some local brown streaks. Its texture shows considerable variation from aphanitic material to coarsely


NEWFOUNDLAND
Miles 0 50 100 Miles
Kilometres 0 50 100 150 Kilometres
60°
58°
56°
54°
52°
52°
51°
50°
49°
48°
47°
46°
12P
2M
12I
12H
12G
2E
2F
12B
12A
2D
2C
11O
11P
1M
1N
11I
1L
1K

Field Areas - Marble Assessment Project - 1985 crystalline stone. A small brook flows across the deposit and has polished some of the quarried fragments to a brilliant white. The rocks are strongly jointed but generally the degree of fracturing is less than other similar deposits in the area (notably the one at Purbecks). The size of the deposit could not be accurately determined because of lack of bedrock exposure. It was traced for 37 m along strike (180°/80°W) and is at least 30 m wide, it has a block configuration. The deposit was sampled along its strike and dip and the results will provide the first analytical data for this marble prospect.

An exposure of blue marble underlies a point of land on the south side of Clay Cove. Projecting offshore, the bed strikes 030° and dips vertically. A central 4 m wide zone of black and blue gray marble containing white carbonate veinlets is flanked by mixed blue marble and carbonate schist.

Canada Bay Area

This deposit is located about 250 m south of the abandoned settlement of Canada Harbour and forms Marble Ridge, a prominent topographic feature. The strike of the marble unit controls the trend of the ridge which is slightly east of north. The unit is folded into an upright anticlinal structure. This and other structural complications have created uncertainty with regard to the thickness of the unit. Besaw (1973) after Bain (1937) estimated it to be about 36 m. Our sampling measurements indicate the marble is at least 20 m thick in the old main quarry #1, near the crest of the hill.

Minor impurities in the marble include chlorite, sericite and quartz. These occur mainly as very thin films along bedding planes and joints and probably comprise less than two percent of the rock. Besaw's (1972) samples showed that there are some areas in the white marble where impurities are less than one percent; hopefully, our detailed sampling will further define these areas. This is of critical importance since white marble with less than one percent impurities would probably constitute a high-value filler product, requiring little beneficiation.

Marble Pond

A deposit of white marble is exposed in the bed of Marble Brook at the place where it flows into Marble Pond, about 3.5 km east of Roddickton. The flat-lying marble apparently extends southward beneath the pond and can be traced continuously northward along the brook for about 50 m. However, it sporadically outcrops along the brook for a much greater distance. The stone has a slightly gray cast and a finely crystalline texture, and breaks into thin slabs not more than 2 cm in thickness. Fairly widely spaced vertical joints trend 340° to 250°. The stone would appear to be well suited for those applications requiring flat slabs, e.g., tiles.

Conche Road Marble

White marble is exposed just north and south of the Conche Highway (Route #432) about 3.5 km east of its junction with the main Roddickton-Englee Highway (Route 433). The north-south trending, eastward dipping (50°) zone crosses the highway and disappears beneath Penny's Pond. The marble is also exposed in the bed of a short access road that leads from the highway to Penny's Pond. The middle and top of the zone consist of high purity, chalky-white marble with a sugary texture. In both locations the marble is poorly exposed, and it is difficult to estimate its width. However, south of the road, it was possible to sample at irregular intervals across the zone, showing it to be at least 50 m wide at that point. North of the road, near Penny's Pond, we were able to sample across a width of 22 m. These are only approximations, however, because in both sites the contacts of the marble were not observed. The Conche Road deposit may be the most promising deposit in the Canada Bay area since it resembles the Canada Harbour marble and is much more accessible.

Corner Brook Area

Carbonate rocks of the St. George Group in the Corner Brook area host several active and dormant quarries, some of which contain white marbles with potential commercial value as fillers. Of several quarries visited, only the Junction Quarry would appear to contain marble with the potential degree of whiteness necessary for that use. This quarry is located at the base of a 100 m cliff on the south side of the Trans Canada Highway some 6 km east of Corner Brook. Between 1925 and 1943 it supplied limestone to the local pulp and paper mill.

A coarsely crystalline white marble along with a black or dark gray variety, and a pink banded marble, are exposed in a high vertical cliff wall at the Junction Quarry. The white marble section was sampled along approximately 15 m of the southwest quarry face. The whole formation dips steeply northwestward towards the highway.

A marble deposit of potential economic interest is exposed in the Dormston Quarry about a kilometre southeast of Corner Brook. This dormant quarry is located in north-south striking, westerly dipping (60°) beds of the Table Head Formation. The black, fine to medium grained marble has a tendency to break into cubical fragments which, according to Goudge (1977), could potentially yield terrazzo chips of extremely high quality.

All of the samples collected from marble deposits in the Corner Brook and other areas have been sent to the Department of Mines and Energy geochemical laboratory for chemical analyses. Selected representative samples are also being prepared for tests to determine their whiteness and brightness qualities.

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EPITHERMAL GOLD MINERALIZATION IN LATE PRECAMBRIAN VOLCANIC ROCKS ON THE BURIN PENINSULA

by

Allan Huard and Cyril O'Driscoll
Mineral Deposits Section

Introduction

A program to evaluate the gold potential of late Precambrian volcanic rocks of the Burin Peninsula was initiated in 1984 (O'Driscoll, 1984). The area had been mapped in 1976 and 1977 by O'Driscoll and Hussey and it was indicated that the Hickey's Pond area may have economic potential for precious metals. Last year's work (Huard and O'Driscoll, 1985) defined linear, north-northeast trending, alteration belts on each side of the Swift Current Granite. These linear belts are marked by the occurrence of hydrothermal exhalations of chert (± alunite ± specularite ± pyrite), and variably altered volcanic rocks (now sericite ± pyrophyllite ± pyrite schists). This year's objectives were 1) to determine if these belts continue southward, and 2) to see if similar styles of alteration and mineralization are associated with volcanic rocks in the area of the Cape Roger Mountain Batholith and the granitoids at the "Knee" of the Burin Peninsula, both of which are similar to the Swift Current Granite.

Huard and O'Driscoll (1985) showed that the quartz-alunite-specularite-pyrite bodies are similar to sinters deposited in hot springs. They also showed that these sinters contain more gold than the schistose, commonly pyritiferous, altered volcanic rocks. The best results (up to 6 g/t) came from the Hickey's Pond quartz-alunite-specularite showing, which was the largest previously known deposit (250 m long). It was unique in that it was the only showing containing 1) abundant alunite, which gives much of the rock a distinct pink color, and 2) breccias, cemented with a very specularite-rich matrix, which give the highest gold values.

Swift Current Granite Area

During the 1985 field season, another quartz-alunite-specularite-pyrite sinter (the Tower Showing) was discovered along the trend of the eastern alteration belt, 11 km south-southwest of Hickey's Pond (Figure 1). A well-defined zonation is present, with massive gray chert on the eastern side, and pyrite, specularite and alunite-bearing cherts toward the west. Specularite occurs disseminated in bands within the pink alunite-rich rock. The sinter is in probable fault contact with granite to the west. It is bounded by a large pond to the north. The southern extent is unknown as it strikes into a large ridge of glacial till approximately 500 m wide, beyond which is another pond. In the east, it is bounded by unaltered felsic crystal tufts. The zone is approximately 450 m x 100 m.

In the Western Belt, two of the showings discovered in 1984 are larger than previously believed. Location E (Figure 1) includes scattered outcrops of gray chert and minor, pink, alunite-rich chert over a 200 m x 40 m area. Slightly flattened, spheroidal, siliceous nodules resembling geyserite eggs comprise over half of the rock at a small outcrop on the southern end of this showing. Location A (Figure 1) was re-examined, gray chert, and pink alunite-rich chert were recognized.

LEGEND

DEVONIAN

ACKLEY GRANITE

6 Massive, pink, coarse grained, feldspar megacrystic, biotite granite.

CAMBRIAN OR EARLIER

SWIFT CURRENT GRANITE (4) AND CAPE ROGER MOUNTAIN BATHOLITH (5)

4,5 Medium grained, foliated to massive, hornblende-biotite granite, granodiorite, and syenite.

HADRYNIAN OR EARLIER

LOVE COVE GROUP

3 Green graywacke, arkosic sandstone, and conglomerate.

2 Predominantly felsic volcanic pyroclastics and flows. Minor mafic flows and tuffs, and minor mafic dikes.

1 Predominantly mafic flows, tuffs and dikes, with minor intercalated felsic tuffs.

SYMBOLS

specularite showing .... ×

geological contact (approximate) .... - - - -

fault (assumed) .... ∿∿∿∿

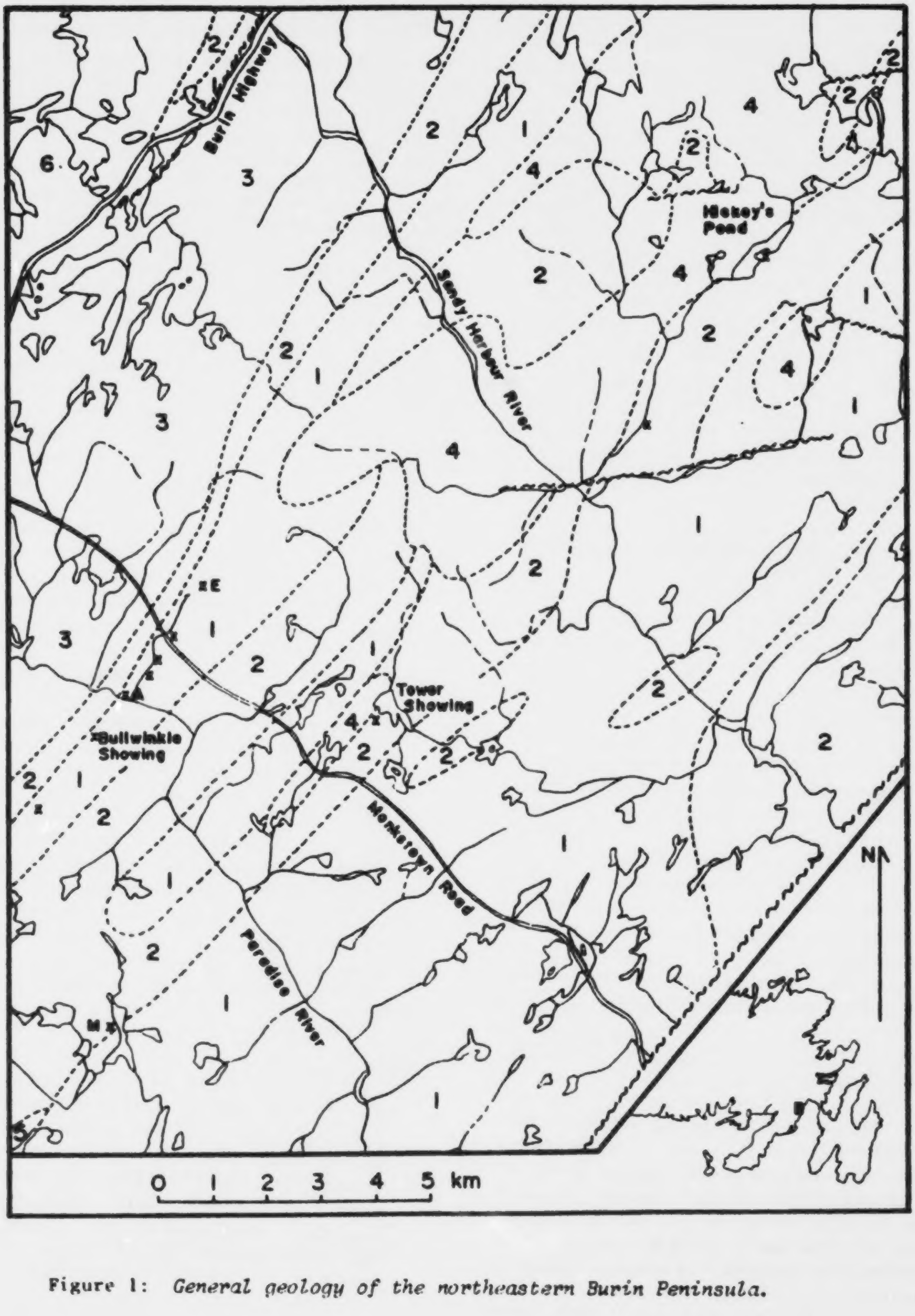
Burin Highway
Sandy Harbour River
Hickey's Pond
Tower Showing
Bullwinkle Showing
Monkstown Road
Paradise River
E
A
M
B
N
0 1 2 3 4 5 km
1
2
3
4
6

Figure 1: *General geology of the northeastern Burin Peninsula.*

The chert at this showing extends southward, forming a shallow ledge across Paradise River and into the southern bank.

A very large quartz-alunite-specularite-pyrite sinter (the Bullwinkle showing) was also discovered during the 1985 field season (Figure 1). It is centered 1 km south-southwest of Location A and is 900 m long. It consists primarily of alunite and specularite-rich cherts, but pyritiferous chert, and specularite-rich chert breccias also occur. This showing is in contact with pyritiferous mafic tuffs to the east and mafic tuffs to the west. A small outcrop of specularite-rich chert occurs 1.5 km south-southwest of the Bullwinkle showing.

Cape Roger Mountain Batholith Area

A southern strike extrapolation from the eastern alteration belt in the Swift Current Granite area occurs on the eastern contact of the Cape Roger Mountain Batholith. This contact is unexposed, however, a zone of alteration 5 km long parallels it, 1 km to the east. It is characterized by sericite schist, pyritiferous sericite schist, and two occurrences of gray chert boulders. A small outcrop of gray chert occurs in this belt at grid reference 811691 (Terrenceville (1M/10) map sheet). Several kilometres to the north-northeast at Location M, specularite occurs in very small veinlets and disseminations in rhyolites.

Other Granitoids - Burin Peninsula Knee Area

Pyritiferous chert, which may be a sinter, occurs in discontinuous outcrops over a zone 700 m long at grid reference 520544 (Baine Harbour (1M/7) map sheet). The northernmost part of the zone is parallel to the regional northeast cleavage. However, towards the south, the chert bodies are gradually rotated into, and then parallel for several hundred metres, an east-southeast striking shear zone (mapped by O'Brien and Taylor, 1983). Pyritiferous sericite schist was found in several localities near the margins of the granitoids.

Work during the 1985 field season has demonstrated that alteration and mineralization similar to that at Hickey's Pond occurs in extensive zones along the Burin Peninsula. The late Precambrian volcanics which host these zones extend for many kilometres north and south of the study area. Pyrite-sericite ± pyrophyllite schists occur throughout the volcanic rocks and are all potential gold exploration target areas.

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METALLOGENIC STUDIES - CENTRAL NEWFOUNDLAND

by

B.F. Kean and D. Evans
Mineral Deposits Section

Metallogenic studies in the Victoria Lake Group, which were initiated in 1984, continued this year with emphasis on the Tulks Hill volcanics.

The Victoria Lake Group underlies west-central Newfoundland, extending from Grand Falls to King George IV Lake. The Victoria Lake Group is a pre-Caradocian 'island arc type' sequence which consists predominantly of volcanic rocks in the southwest and a laterally equivalent, predominantly clastic, sedimentary rock sequence in the northeast (Figure 1). The volcanic sequence consists of mafic pyroclastics, epiclastics, pillow lavas, and lenticular belts of felsic pyroclastics. The two major belts of felsic volcanics are the 'Tulks Hill volcanics' and the 'Tally Pond volcanics'. These felsic volcanic units host numerous showings and six significant sulfide prospects or deposits; namely, the Victoria Mine, Jacks Pond, Tulks East, and Tulks Hill in the Tulks Hill volcanics, and the Tally Pond (Boundary) deposit and Burnt Pond prospect in the Tally Pond volcanics.

The Victoria Lake Group is interpreted to overlie the Annieopsquotch ophiolite. The volcanic sequence of the Victoria Lake Group is conformably overlain by the sedimentary rocks of the Harbour Round Formation. The clastic sedimentary rock facies of the Victoria Lake Group is conformably overlain by Caradocian black shale and chert.

The 1985 field program consisted of four main projects:

1. Regional mapping. This was concentrated mainly in the Lake Ambrose map area (12A/10) and it involved mapping new exposures created by logging roads that have been constructed since the original mapping in 1977. A number of new felsic pyroclastic units and alteration zones were outlined. Also a number of new base metal sulfide showings were discovered. New, possibly fossiliferous, limestone lenses were discovered near Jacks Pond, Harbour Round Pond and Carter Lake. Approximately fifty mafic volcanic rocks were collected for petrogenetic studies. An updated geological map of this area will be published at a later date.

2. Detailed mapping. This involved stratigraphic, structural and alteration studies around the Jacks Pond, Tulks East and Tulks Hill prospects. The Jacks Pond prospects was mapped as part of a B.Sc. Honours thesis. New sulfide showings were found at Cathy's Pond and Jacks Pond ridge. Sericitic, chloritic and silicic alteration aureoles associated with the showings were mapped.

3. Documentation of major prospects. This involved mapping and the logging of drill core to identify stratigraphic and/or structural elements, as well as alteration assemblages associated with mineralization. A study of the sulfide mineralogy and the relationships and char-

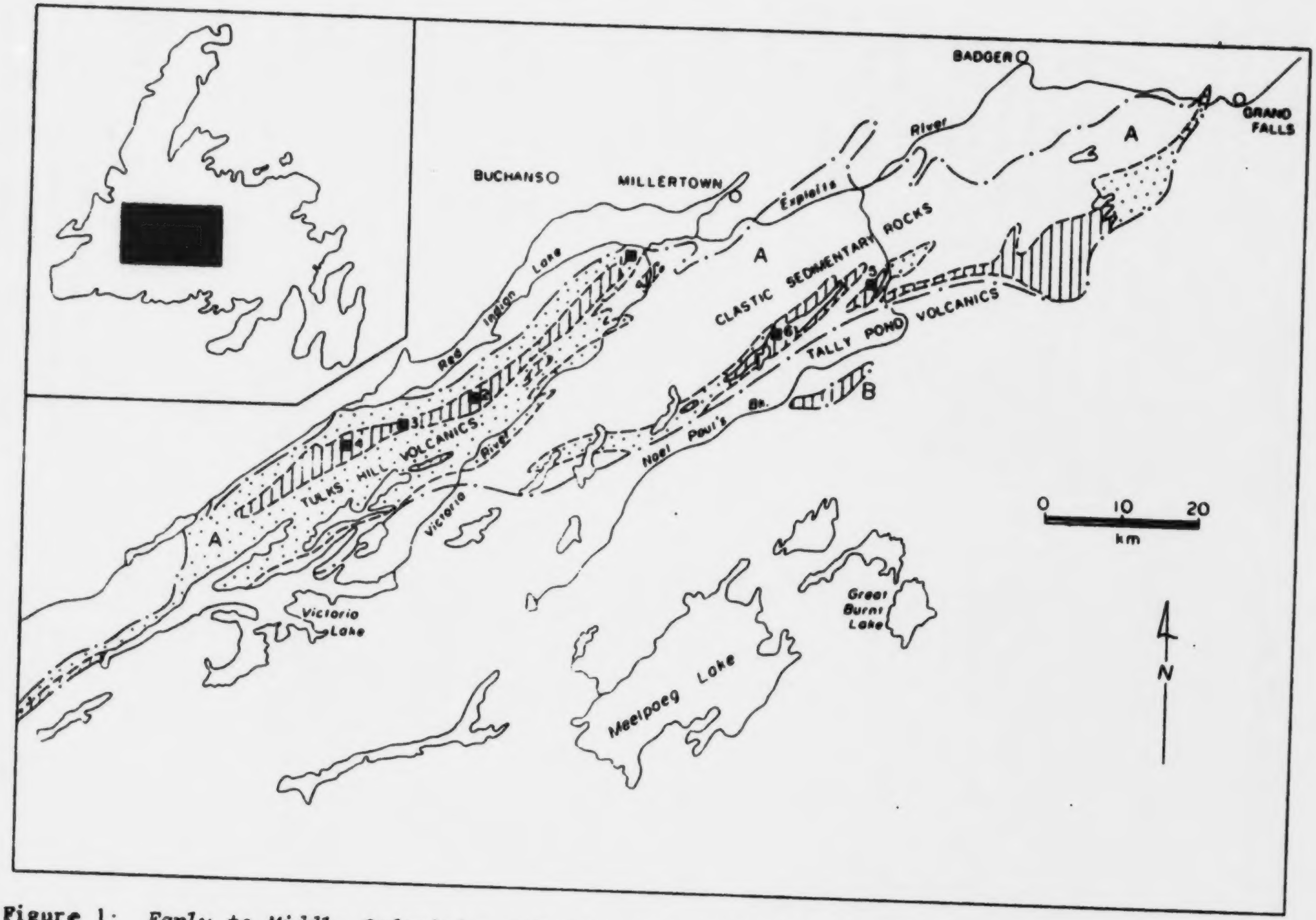
BADGER
GRAND FALLS
A
River
BUCHANS
MILLERTOWN
Exploits
A
CLASTIC SEDIMENTARY ROCKS
TALLY POND VOLCANICS
B
Red Indian Lake
TULKS HILL VOLCANICS
River
Victoria
Noel Paul's Bk.
A
0
10
20
km
Victoria Lake
Great Burnt Lake
Meelpaeg Lake
N
1
2
3
4
5
6

Figure 1: *Early to Middle Ordovician volcanic-dominated island arc sequences and massive sulfide deposits (solid squares) in central Newfoundland. A - Victoria Lake Group; B - Carter Lake Formation. Vertical lines - felsic volcanic rocks; stippled areas - mafic and intermediate volcanic rocks. Massive sulfide deposits: 1. Victoria Mine; 2. Jacks Pond; 3. Tulks East; 4. Tulks Hill; 5. Burnt Pond; 6. Tally Pond (after Swinden and Thorpe, in press).*

acteristics of the mineralization was also included. The Jacks Pond, Tulks East and Tulks Hill prospects were studied. This study documented the presence of massive sulfides, transported clastic sulfides and disseminated sulfides in sericitic, chloritic and silicified alteration zones.

4. Regional gold sampling. All alteration zones, major structural lineaments/faults, mineralized areas and numerous quartz veins were systematically sampled for gold analysis. Visible gold in float of vein-quartz was again found in the second Exploit River southwest of King George IV Lake (see also Kean and Jayasinghe, 1981). Approximately 300 samples were collected.

The major results and interpretation of the field work will be published in Current Research, Report 86-1.

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METALLOGENY OF THE SOUTHERN PART OF THE ROBERTS ARM GROUP, CENTRAL NEWFOUNDLAND

by

H. Scott Swinden[1] and Paul E. Sacks[2]
Economic Geology and Mineralogy Division
Geological Survey of Canada

Introduction

This report summarizes the initial results of a four year program to investigate the metallogeny of the "Buchans-Roberts Arm Belt", a sequence of Ordovician volcanic, volcaniclastic and subvolcanic rocks in the north-central part of the Dunnage Terrane, central Newfoundland. The belt includes the Buchans, Roberts Arm, Cottrell's Cove, Chanceport and Frozen Ocean groups (Figure 1), and hosts numerous volcanogenic sulfide occurrences, including the well known Buchans orebodies and former producers at Gullbridge and Pilley's Island.

Field work during 1985 was carried out in the southern part of the Roberts Arm Group between Lake Bond and the Handcamp prospect (Figure 2), encompassing parts of the Great Gull Lake (12H/1) and Springdale (12H/8) map areas. The last regional mapping in this area was by Kalliokoski (1955) at a scale of 1 inch = 1 mile. Later geologic compilations at 1:50,000 by Dean and Strong (1976) were based on Kalliokoski's maps, supplemented by data from more recent, detailed, exploration company maps.

The southern part of the Roberts Arm Group hosts a number of volcanogenic sulfide occurrences. The largest of these is the Gullbridge Mine, which produced approximately 3 million tonnes of ore grading 1.1 percent Cu between 1967 and 1972. A somewhat smaller deposit at Lake Bond is estimated to contain over 1 million tonnes grading 0.3 percent Cu and 2 percent Zn. There are many smaller occurrences and in most cases, their stratigraphic, structural and genetic relationships to the larger, better known deposits is not well understood. One showing of particular interest is the Handcamp Prospect 10 km northeast of Gullbridge, which has yielded significant gold values and is the only showing in the Roberts Arm Group which is primarily a gold target.

During the 1985 field season, all previously reported mineral occurrences were examined and mapped in detail where exposure warranted. Representative samples were taken for assay and whole rock geochemical studies. Geological units were traced throughout the area so as to define the stratigraphic and structural relationships between the showings.

Regional Geology

The Roberts Arm Group in the project area consists of mafic and felsic volcanic and subvolcanic rocks, lesser volcaniclastic rocks and minor chemical sediments. Mafic volcanics are dominantly pillowed flows, locally plagioclase phyric and/or vesicular, and generally comprise 60 to 70 percent of the strati-

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[1] Geological Survey of Canada, St. John's, Nfld.

[2] Department of Earth Sciences, Cornell University, Ithaca, N.Y.

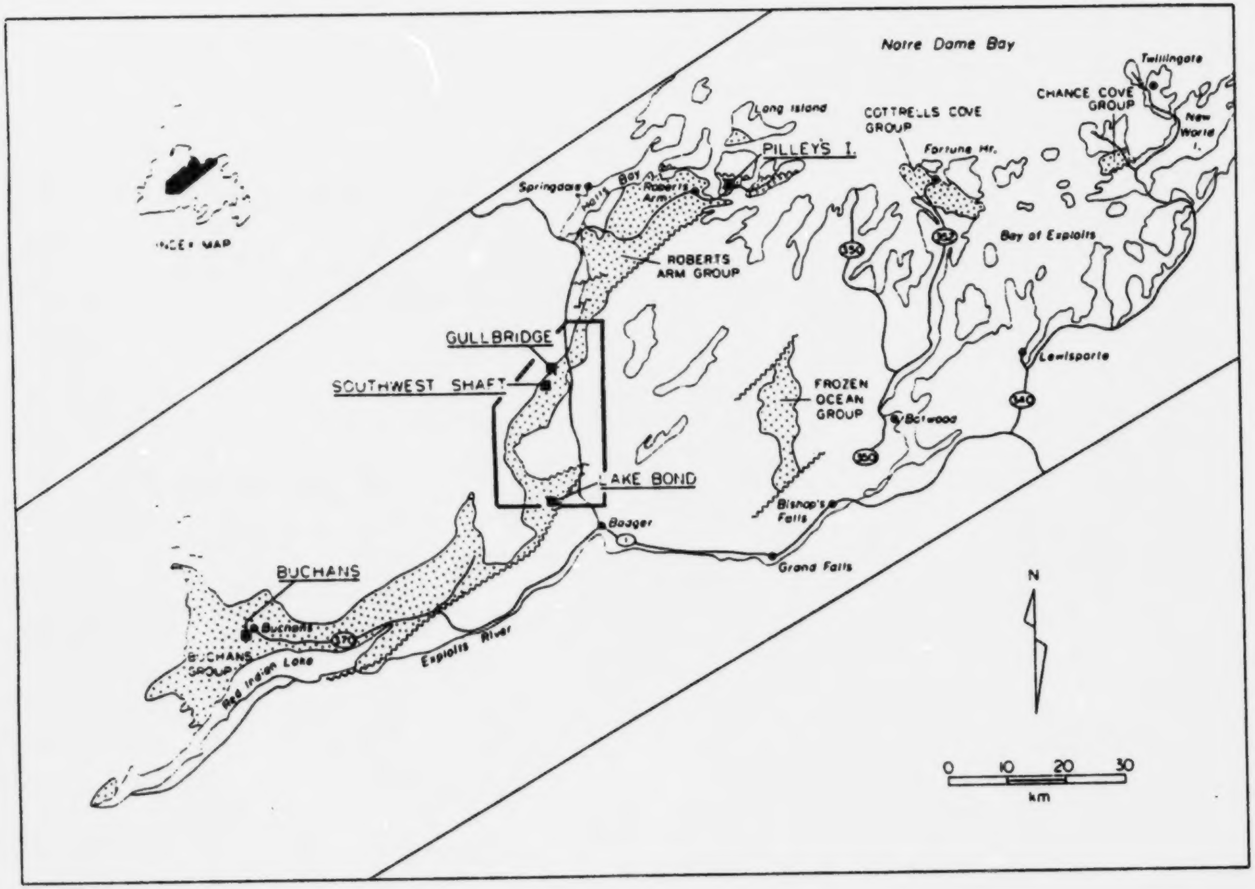
INDEX MAP
Notre Dame Bay
Twillingate
CHANCE COVE GROUP
New World I.
Long Island
COTTRELLS COVE GROUP
PILLEY'S I.
Fortune Hr.
Springdale
Halls Bay
Roberts Arm
354
352
Bay of Exploits
ROBERTS ARM GROUP
GULLBRIDGE
SOUTHWEST SHAFT
FROZEN OCEAN GROUP
Lewisporte
Botwood
350
340
LAKE BOND
Bishop's Falls
Badger
Grand Falls
BUCHANS
Buchans
370
BUCHANS GROUP
Red Indian Lake
Exploits River
N
0
10
20
30
km

Figure 1: *Location of the Buchans-Roberts Arm belt. Solid squares are the principal volcanogenic sulfide deposits. Heavy solid line is the 1985 project area and the area shown in Figure 2.*

graphic section. Massive flows are present locally. Felsic volcanics are dominantly pyroclastic, consisting of crystal and crystal-lithic ash flow tuffs, although probable rhyolite flow rocks have been identified west of Dawes Pond and west of Great Gull Pond near the Gullbridge Mine. Volcaniclastic rocks form units mappable at 1:50,000 scale in two areas. West of Lake Bond, green, fine to medium grained greywacke and pebbly conglomerate are interbedded with green volcaniclastic chert. North of the Trans Canada Highway and west of Handcamp, medium grained greywacke forms a narrow belt which interfingers with mafic volcanic rocks to the south, near the north end of Great Gull Pond. Both volcaniclastic units have previously been assigned to the Crescent Lake Formation (Dean and Strong, 1976).

The western contact of the Roberts Arm Group is intruded by Acadian plutonic rocks in the project area. The eastern contact with presumed late Ordovician to Silurian turbidites of the Sansom Formation has generally been interpreted as west-facing and conformable to disconformable with Roberts Arm Group strata overlying the turbidites (Dean and Strong, 1976; Dean, 1977; Kean et al., 1981). However, the present mapping has shown that rocks east of Great Gull Pond are locally highly strained and regionally metamorphosed. Quartzofeldspathic paragneiss is a common rock type in this area and staurolite and andalusite are common constituents of pelitic units. Mylonites are present in several locations and migmatites were identified in one area. These rocks are probably not Sansom Greywacke and their contact with the greenschist facies volcanic rocks of the Roberts Arm Group is certainly structural. The affinity of this metamorphic terrane is uncertain although it is lithologically similar to some rocks of the Spruce Brook Formation and related units to the southeast (Colman-Sadd and Swinden, 1984; Colman-Sadd, 1985). Rocks which have previously been assigned to the Sansom Greywacke in the Great Gull Pond and Powderhorn Lake areas, as well as some rocks previously assigned to the Crescent Lake Formation southeast of Great Gull Pond, are now thought to be affiliated with this metamorphic terrane (Figure 2).

Economic Geology

Volcanogenic mineralization in the project area is dominantly of stockwork type. For descriptive purposes, the numerous showings are grouped into three broad areas: i) Lake Bond area, ii) Gullbridge - Dawes Pond West area, and iii) Handcamp.

i) Lake Bond area:

Mineralization in the Lake Bond area was discovered in the 1950's by New Jersey Zinc who conducted an extensive diamond drill program and outlined a substantial body of subeconomic Cu and Zn mineralization. Later exploration by Noranda and Consolidated Morrison Mines in the 1970's failed to prove an economic grade or tonnage. The main deposit is well exposed in a series of trenches over the main zone which reveal intensely altered pillow lavas containing variable amounts of disseminated and stringer pyrite, chalcopyrite and sphalerite. The associated alteration assemblage is mainly epidote-chlorite-pyrite although, locally, zones of quartz-sericite-pyrite alteration are present. The mineralization forms a large stockwork and is not obviously related to any nearby felsic volcanics. Anomalous epidote-chlorite alteration is well developed and easily recognizable over an area of approximately 2 km^2 west and southwest of the deposit. Several minor sulfide occurrences in this area contain mainly

LEGEND

C	Carboniferous - fluviatile red sediments
SD	Siluro-Devonian plutonic rocks
OS	Ordovician-Silurian Sansom Greywacke: volcaniclastic turbidites
OR	Roberts Arm Group: mafic to felsic volcanic and subvolcanic rocks; lesser volcaniclastics.
O?	Metamorphic rocks: quartzite, andalusite ± staurolite bearing semipelitic schist; paragneiss.

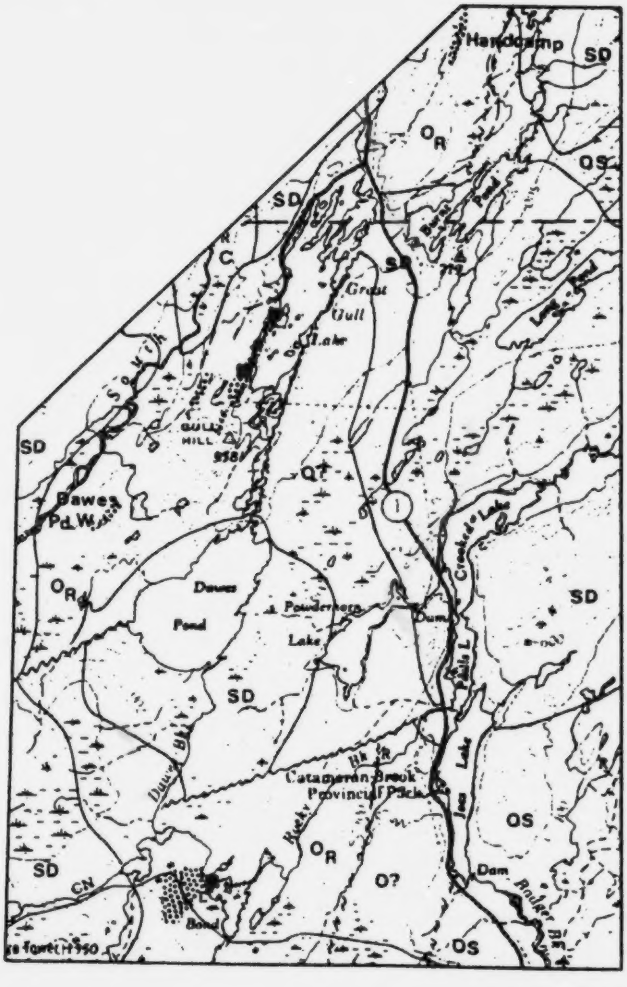
Handcamp
SD
O_R
OS
SD
C
SD
Great
Gull
Lake
GULL
HILL
958
SD
Dawes
Pd.W.
O?
1
Crooked Lake
O_R
Dawes
Pond
Powderhorn
Lake
SD
SD
Dam
Lake
Catamaran Brook
Provincial Park
Rocky Bk
OS
O_R
O?
SD
CN
Bond
Dam
OS

Figure 2: *General geology in the Lake Bond-Handcamp area. Solid squares are volcanogenic sulfide deposits shown in Figure 1. Heavy stipple denotes hydrothermal alteration with stringer to disseminated mineralization.*

disseminated pyrite and are interpreted as a pyritic facies of the widespread hydrothermal alteration that records the Lake Bond mineralizing event.

ii) Gullbridge - Dawes Pond West area:

Disseminated and stringer pyrite with lesser chalcopyrite is widespread in intensely altered volcanic rocks in the area between Gullbridge and Dawes Pond West (Figure 2). The largest deposit is the Gullbridge Mine, a sulfide- rich stockwork in a variably altered mafic volcanic assemblage. It has locally been metamorphosed to a cordierte and anthophyllite-bearing assemblage by the thermal effects of a nearby granite intrusion. The alteration zone which hosts the Gullbridge deposit can be traced geophysically and in outcrop for more than 4.5 km along strike. The Southwest Shaft deposit, approximately 2.5 km southwest of Gullbridge, occurs within this alteration zone and includes a small massive sulfide lens. Between Gullbridge and Southwest Shaft, the alteration zone is dominantly within mafic volcanic rocks. However it appears to crosscut the stratigraphy at a shallow angle, and to the southwest is primarily within the overlying felsic volcanic rocks. The numerous showings in this area constitute exposures of particularly sulfide-rich facies of the quartz-sericite-pyrite alteration assemblage. The alteration zone eventually disappears under thick drift west of Gull Hill. Relatively intense deformation of the Roberts Arm Group is recorded in alteration zone rock types by a well developed penetrative schistosity, crenulation cleavages, kink bands and box folds, and flattened lithic clasts in coarse volcanic breccias. The degree of deformation is consistent with the tentative conclusion that the main alteration zone is an originally crosscutting stockwork zone which has been transposed and flattened by deformational events.

Similar alteration and mineralization is found in a 1.3 km long zone northwest of the main alteration zone. A third zone can be traced for approximately 2 km southwest of Starkes Pond (Figure 2). These alteration zones are dominantly within felsic volcanic rocks and it is not clear whether they are fault or fold -repetitions of the main zone, or whether they record separate hydrothermal systems. Both are characterized by a quartz-sericite-pyrite assemblage.

The stratigraphic interval which hosts most of the mineralization and alteration between Gullbridge and Dawes Pond West is characterized by pervasive alteration, disseminated and stringer sulfides and numerous thin lenses of ferruginous chert which locally attain a thickness of greater than 10 m. With the possible exception of the Southwest Shaft, no exhalative sulfide bodies have been recognized in this area. However, the abundance of ferruginous chert in this stratigraphic interval suggests that these chemical sediments may have formed through exhalations that were related to the extensive hydrothermal system which is found here.

Although it is not clear if all of these alteration zones are part of the same hydrothermal system, the stratigraphic and structural settings are similar and are clearly very different from the mineralization in the Lake Bond area.

iii) Handcamp area:

The Handcamp prospect was discovered in 1928 and is the only significant gold prospect in the Buchans-Roberts Arm Belt. In view of the present day exploration emphasis on this commodity, this prospect assumes some importance, not only as a potential economic deposit, but also as a case study of gold concentration processes that may have been operative elsewhere in the belt.

The prospect has been extensively prospected and explored, most recently by Falconbridge Nickel Mines Ltd. (1977-1979) and U.S. Borax (1981-1983). Base and precious metal mineralization is restricted to a stratigraphic interval up to 30 m thick on surface which is characterized by abundant chemical sediments, argillites and intense hydrothermal alteration. The mineralization consists of pyrite, chalcopyrite, sphalerite and minor galena, hosted by altered volcanic, volcaniclastic and chemical sedimentary rocks. Epidote-chlorite-magnetite alteration characterizes the mafic volcanic rocks in the mineralized zone and the sulfide-gold mineralization is intimately associated with quartz-sericite-pyrite alteration. Magnetite is abundant throughout the mineralized area.

The mineralized horizon has been traced for over 1200 m by mapping and diamond drilling. Gold mineralization is erratic and although up to 8 ppb gold is present over 1 m widths on surface, no consistent tonnage has yet been proven.

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CHARACTERISTICS OF CARBONATE-HOSTED LEAD-ZINC MINERALIZATION, WESTERN NEWFOUNDLAND

by

C.M. Saunders and D.F. Strong
Department of Earth Sciences, Memorial University of Newfoundland
St. John's, Newfoundland, A1B 3X5

Sixty-one mineral occurrences were examined and sampled during the summer of 1985 as part of the Carbonate Project of the western Newfoundland E.R.D.A. Program in contract with Canewf Resources Ltd. The occurrences are found in Cambrian to Mississippian limestones and dolostones which outcrop from Port au Port to the tip of the Great Northern Peninsula.

The objectives of the field component of the project were as follows.

1. Document relevant qualitative and quantitative information concerning the selected mineral occurrences/ showings and record the following information:

   i) Unique identification code or number.

   ii) Exact location.

   iii) Lithologic description, strike and dip and formation name(s) of host rocks.

   iv) Detailed description of the nature of mineralization.

   v) Detailed description of the observed minerals.

   vi) Detailed description of any diagnostic features such as zoning, alteration or any unique textural relationships.

   vii) Strike and dip of the mineralized zone.

   viii) Physiographic description and a detailed geological sketch map of the occurrence.

2. Collect and document rock samples from selected mineral occurrences/ showings.

The occurrences can be grouped into two basic types: I "Mississippi Valley Type" open-space filling, associated with secondary white dolomite, and II vein/open-space filling associated with calcite plus or minus barite. Within type I there exists a gradation between two end-members:
(a) mineralization restricted to fractures, veinlets, small clots and disseminations in low porosity/permeability dolostones predomin-antly of Cambrian age, and
(b) mineralization found in open spaces and in the matrix to dolomite pseudobreccias and collapse breccias developed in predominantly Ordovician strata.
Type II can be subdivided into three categories.
(a) vein/open-space filling mineralization hosted by Mississippian rocks of the Codroy Group, which are characterized by high porosity and permeability,
(b) vein mineralization hosted by relatively impermeable Ordovician rocks of the Table Head and St. George groups, but of the same age and type and part of the same overall mineralizing system as type II-(a), and
(c) vein mineralization of unknown age and affinity.

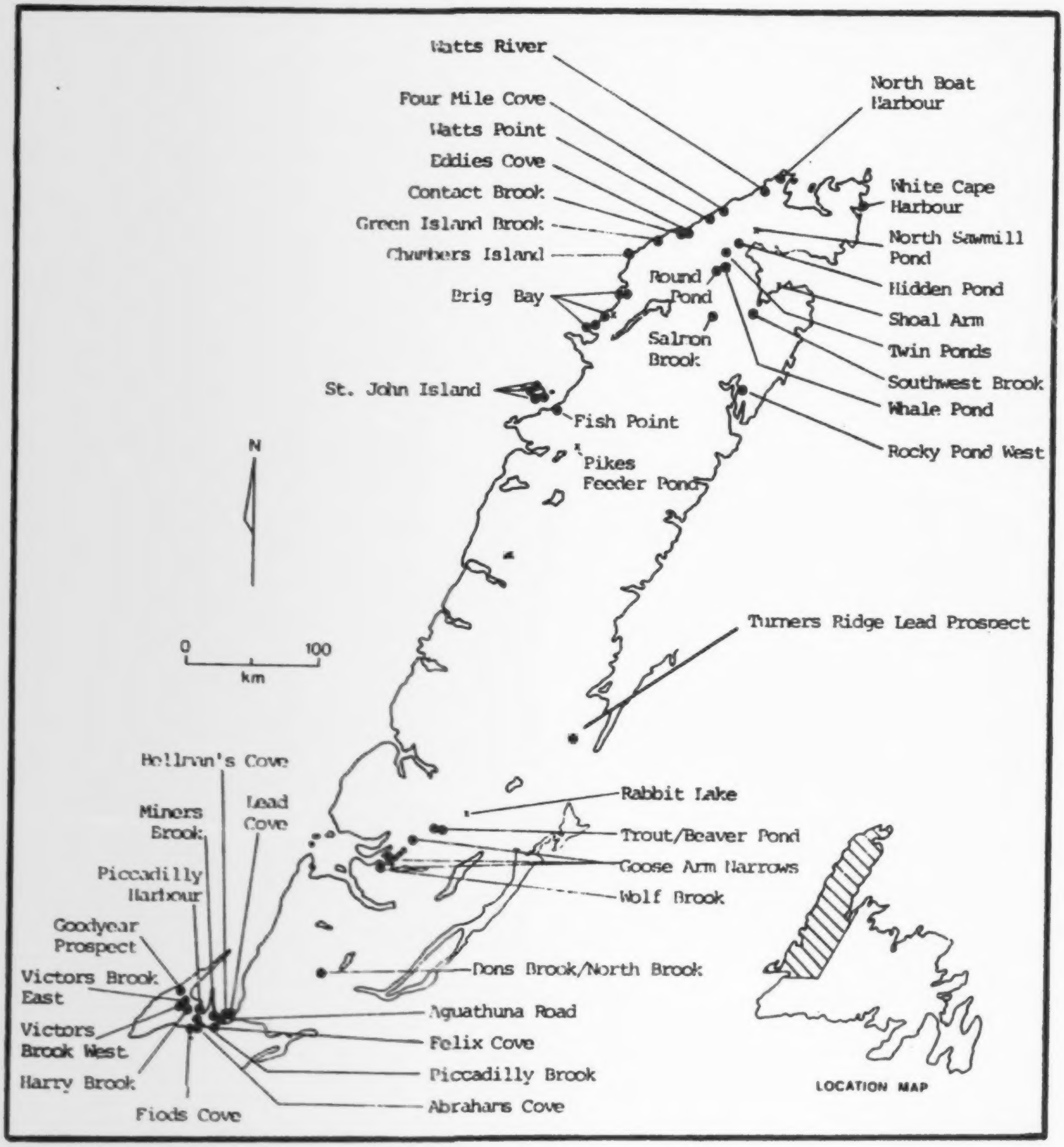

Watts River
North Boat Harbour
Four Mile Cove
Watts Point
Eddies Cove
Contact Brook
Green Island Brook
Chambers Island
White Cape Harbour
North Sawmill Pond
Round Pond
Hidden Pond
Brig Bay
Shoal Arm
Salmon Brook
Twin Ponds
Southwest Brook
St. John Island
Whale Pond
Fish Point
Rocky Pond West
Pikes Feeder Pond
N
0
100
km
Turners Ridge Lead Prospect
Bellman's Cove
Rabbit Lake
Miners Brook
Lead Cove
Trout/Beaver Pond
Goose Arm Narrows
Piccadilly Harbour
Wolf Brook
Goodyear Prospect
Dons Brook/North Brook
Victors Brook East
Aguathuna Road
Victors Brook West
Felix Cove
Piccadilly Brook
Harry Brook
Abrahams Cove
Fiods Cove
LOCATION MAP

Figure 1: *Mineral occurrences being studied as part of the Newfoundland E.R.D.A. Carbonate Project. • - occurrences sampled; x - occurrences not sampled due to inaccessibility or non-availability of core.*

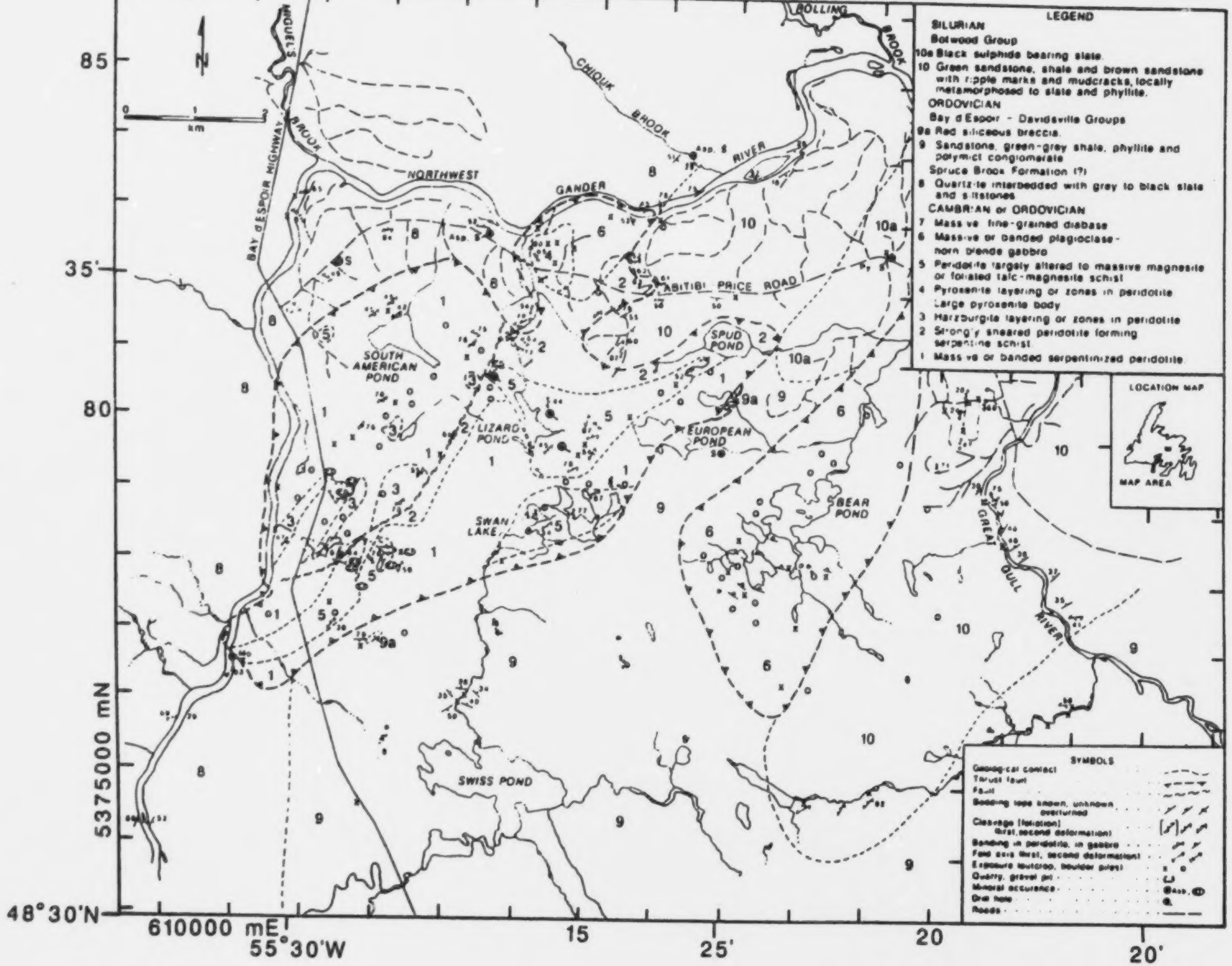
MAGNESITE-TALC MINERALIZATION IN THE GREAT BEND OPHIOLITE, EASTERN NEWFOUNDLAND

by

Edward J. Zwicker and D. F. Strong
Department of Earth Sciences
Memorial University of Newfoundland

Ultramafic and gabbroic rocks of the Great Bend area, commonly referred to as the Great Bend Ophiolite, have been mapped under contract between Canewf Resources Ltd. and the Canada-Newfoundland E.R.D.A. Program. Mapping was at a scale of 1:12,500 and in more detail in some areas, substantially revising the existing geological map (Figure 1). In particular, a belt of sedimentary rocks is found to cleanly separate the gabbroic rocks from the ultramafic rocks, allowing for the possibility that they may have separate origins. The area of known talc-magnesite has been significantly increased, and the suggestion by earlier workers of mineralization being controlled along fault and shear zones has been supported. Chromite lenses and pods are common throughout the serpentinized harzburgites and dunites, and these are also being investigated for platiumn group elements. Zones of sulfide and arsenopyrite mineralization are commonly associated with quartz veins in the surrounding sedimentary rocks, and these may have further economic potential.

Figure 1: GREAT BEND ULTRAMAFIC BODY, NEWFOUNDLAND



LEGEND
SILURIAN
Botwood Group
10a Black sulphide bearing slate.
10 Green sandstone, shale and brown sandstone with ripple marks and mudcracks, locally metamorphosed to slate and phyllite.
ORDOVICIAN
Bay d'Espoir - Davidsville Groups
9a Red siliceous breccia.
9 Sandstone, green-grey shale, phyllite and polymict conglomerate
Spruce Brook Formation (?)
8 Quartzite interbedded with grey to black slate and siltstones
CAMBRIAN or ORDOVICIAN
7 Massive fine-grained diabase
6 Massive or banded plagioclase-hornblende gabbro
5 Peridotite largely altered to massive magnesite or foliated talc-magnesite schist
4 Pyroxenite layering or zones in peridotite
Large pyroxenite body
3 Harzburgite layering or zones in peridotite
2 Strongly sheared peridotite forming serpentine schist
1 Massive or banded serpentinized peridotite
SYMBOLS
Geological contact
Thrust fault
Fault
Bedding tops known, unknown overturned
Cleavage (foliation) (first, second deformation)
Banding in peridotite, in gabbro
Fold axis (first, second deformation)
Exposure (outcrop, boulder piles)
Quarry, gravel pit
Mineral occurence
Asb.
Drill hole
Roads
LOCATION MAP
MAP AREA
N
0
1
2
km
85
35'
80
5375000 mN
48°30'N
610000 mE
55°30'W
15
25'
20
20'
MIGUEL'S BROOK
BAY d'ESPOIR HIGHWAY
NORTHWEST GANDER RIVER
CHIOUK BROOK
ROLLING BROOK
ABITIBI PRICE ROAD
SOUTH AMERICAN POND
LIZARD POND
SWAN LAKE
SPUD POND
EUROPEAN POND
BEAR POND
SWISS POND
GREAT GULL RIVER

GEOLOGICAL SETTING OF SULFIDE MINERALIZATION AT TILT COVE, NEWFOUNDLAND

by

D.F. Strong and C.M. Saunders
Department of Earth Sciences
Memorial University of Newfoundland

Mapping of the Tilt Cove area was carried out by the first author in 1980, funded by Newmont Exploration of Canada Ltd., and the second author in 1984, funded by the Geological Survey of Canada. The mapping was controlled by cut lines spaced at 100 m which were chained and flagged at 25 m spacings. The geology of the Tilt Cove area is summarized in Figure 1 (modified after Upadhyay, 1973). The three main stratigraphic units of the area are, from north to south, the Cape St. John Group, the Betts Cove ophiolite, and the Bobby Cove Formation. The ultramafic member of the ophiolite swells from an average width of approximately 150 m to approximately 500 m in the Windsor Lake (Tilt Cove) area. The gabbroic member of the ophiolite is faulted out to the east of Windsor Lake but maintains an average thickness of approximately 400 m to the west of the lake. The sheeted diabase unit of the ophiolite occurs only as a thin wedge to the south of Windsor Lake. There is significant tectonic interleaving of the Snooks Arm and Cape St. John groups in the vicinity of Beaver Cove Pond. The massive sulfide orebodies at Tilt Cove and the Nudulama showing both occur in the ophiolite pillow lava unit close to its base, as it does at Betts Cove.

The main mineral deposits of the ophiolite are the massive pyrite-chalcopyrite (± Au ± Ag) orebodies which were mined at Betts Cove and Tilt Cove. Between 1875 and 1878 Betts Cove mine shipped 95,999 tons of ore, said to have averaged greater than 10 percent Cu, from a total production of 130,682 tons of ore and regulus in addition to 2,450 tons of iron pyrite. Grab samples from dumps on the property yielded 4.14 percent Zn, 0.39 to 1.83 percent Cu, 6 dwts. Au and 16 dwts. Ag, both per long ton. A third dump was similarly sampled and yielded 9.42 percent Cu with only traces of Zn and Au.

The Tilt Cove deposits occur at the opposite end of the ophiolite belt from Betts Cove, a distance in excess of 15 km. The Tilt Cove Mine opened in 1864 and operated continuously until 1917, reportedly producing 1,491,136 tons of Cu ore, 78,015 tons of regulus (matte) and 5,416 tons of Cu ingots. The total amount of Cu recovered from these products was estimated at over 61,000 short tons. The West mine contained 8 to 12 percent Cu and the East mine about 4 percent, and some Au, Ag and much sulphur were also recovered. Regular production, at 2,000 tons of Cu ore per day, resumed in 1957 and ceased in 1967, with a total production during the ten-year period amounting to 183,597,125 pounds of Cu and 42,425 ounces of Au from approximately 7,400,000 tons of ore.

The most important contribution of this study is confirmation of the clear stratigraphic control of all mineralization at the base of the ophiolite sequence. It occurs in the variolitic pillow lava and calcite-cemented pillow-breccia unit which extends from the East Mine to the Nudulama showing (Figure 2). The West Mine and the Nudulama showing occur right at the base of this unit, in contact with the sheeted diabase,

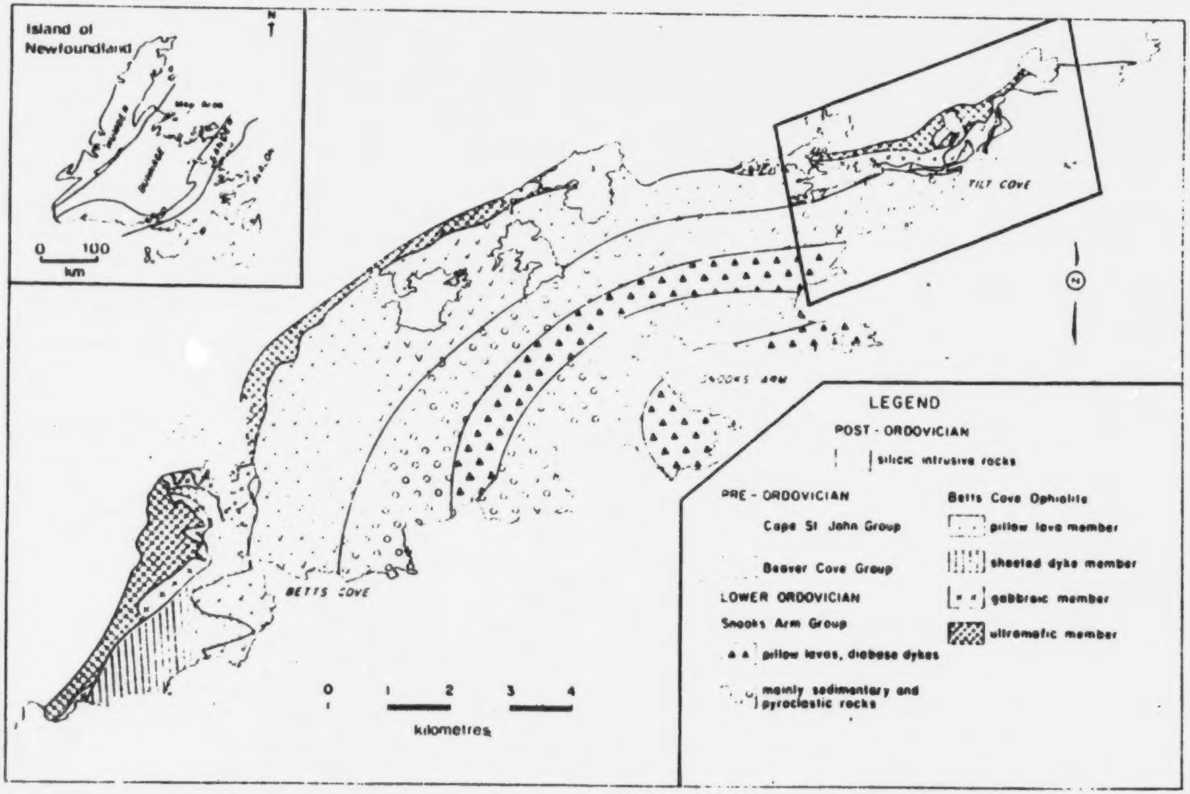

Island of Newfoundland
N
0 100
km
TILT COVE
BETTS COVE
SNOOKS ARM
0 1 2 3 4
kilometres
LEGEND
POST - ORDOVICIAN
silicic intrusive rocks
PRE - ORDOVICIAN
Cape St John Group
Beaver Cove Group
LOWER ORDOVICIAN
Snooks Arm Group
pillow lavas, diabase dykes
mainly sedimentary and pyroclastic rocks
Betts Cove Ophiolite
pillow lava member
sheeted dyke member
gabbroic member
ultramafic member

Figure 1: *General geology of the Tilt Cove - Betts Cove area (modified after Upadhyay, 1973).*

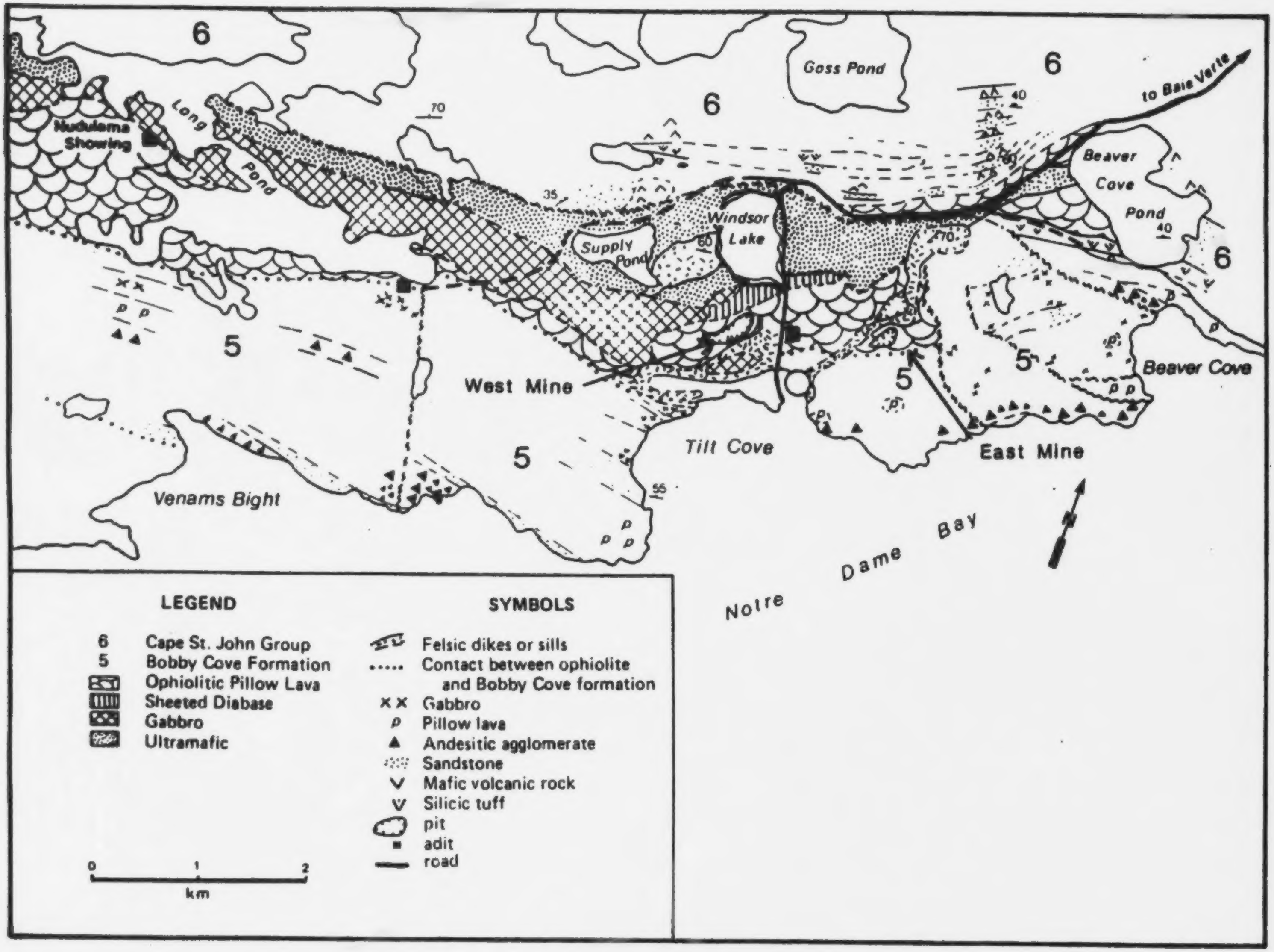

6
Long
Pond
Nudulama Showing
70
35
Goss Pond
6
Supply Pond
60
Windsor Lake
70
40
Beaver Cove Pond
40
6
to Baie Verte
5
West Mine
5
Venams Bight
55
Till Cove
5
5
Beaver Cove
East Mine
N
Notre Dame Bay
LEGEND
6 Cape St. John Group
5 Bobby Cove Formation
Ophiolitic Pillow Lava
Sheeted Diabase
Gabbro
Ultramafic
SYMBOLS
Felsic dikes or sills
Contact between ophiolite and Bobby Cove formation
x x Gabbro
p Pillow lava
▲ Andesitic agglomerate
Sandstone
V Mafic volcanic rock
V Silicic tuff
pit
adit
road
0
1
2
km

Figure 2: *Geological setting of the Tilt Cove deposits.*

whereas the East Mine orebodies are found higher up in the unit. All mineralization is accompanied by intense black chloritization as well as more restricted stockwork pyrite and silica.

The mineralization is mainly pyrite and chalcopyrite, with lesser amounts of sphalerite, as well as traces of galena at Nudulama. Magnetite is common in the ores around Tilt Cove, and is especially striking along with coarse grained specular hematite in the East Mine lode. A curious occurrence of massive to disseminated pyrite-chalcopyrite is found near Mud Pond in the schistose talc- carbonte rocks derived from ultramafic rocks. The sulfide minerals exhibit the same tectonic fabrics as the host-rocks, indicating their pre-deformation origin. Magnetite-bearing cherts are common throughout the volcanic sequence, and are not everywhere associated with sulfide mineralization. These rocks are associated with both the basalt and sandstones at the base of the Cape St. John Group, and locally contain Au as well as Cu mineralization.

Eighty-four rocks were analysed for major element oxides, 17 trace elements, and 9 rare earth elements at Memorial University, and a further 69 analyses of major and some trace elements were provided by Newmont Exploration of Canada Ltd. Electron microprobe analyses of chlorites and other minerals have also been obtained. The aim of these geochemical studies is to clarify features such as the primary compositions of the ore horizon basalts, their magmatic affinities and tectonic significance, and how their chemistry might relate to mineralization, thus providing a guide to exploration.

The main variance of the Tilt Cove data is contributed by MgO and SiO_2, which can be explained in terms of three major processes. The main trend of variation is related to metasomatic gain or loss of silica, producing a silica- rich and a silica-poor group on either side of the main body of data. Rocks in the low-silica group are those described above as being characterized by abundant black chlorite, and they approach the compositions of pure chlorites. The main body of data exhibits a trend related to magmatic processes involving the addition of olivine through advanced partial melting of the upper mantle. The presence of secondary albite in Tilt Cove rocks is reflected in high sodium concentrations in the silica -rich group as well as the central cluster of relatively less altered samples, but not in the chlorite -rich/silica-poor samples.

METALLOGENY OF SOME GRANITOID ROCKS IN NEWFOUNDLAND

by

J. Tuach
Mineral Deposits Section

This project was initiated in April of 1985. Its objectives are to assist in the development of metallogenic models for granitoid mineralization in Newfoundland using a combination of geological, lithogeochemical and isotope studies. An essential part of the project is to document and further define, as far as possible, all of the known granite related mineralization on the island of Newfoundland, and to identify additional plutons or areas which have potential to host granite related mineralization. Elements of particular interest are Sn, W, U, Mo, Sb, Bi, F, Rare Earths, and Au.

The 1985 field season was spent doing a reconnaissance program in western and southwestern Newfoundland to select areas and problems which may be worthy of further study (Figure 1).

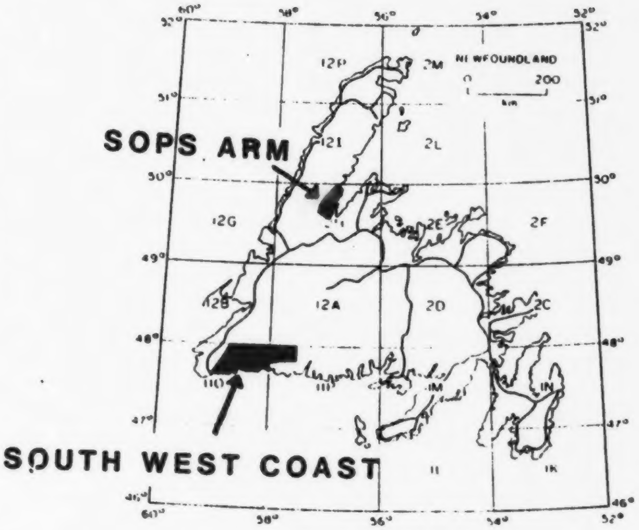


Figure 1: *Metallogenesis of Granitoid Rocks in Newfoundland - Project areas for 1985.*

Sops Arm Area

Approximately one month was spent in the Sops Arm area of White Bay (Smyth and Schillereff, 1982). The possible relationship of the granitoid rocks to gold bearing epithermal-fumarolic systems is currently being investigated. A lithogeochemical survey of the plutonic rocks is in progress, and a suite of samples was collected to initiate a geochronological study.

Fluorite mineralization occurs in the Precambrian Devils Room Granite as fracture coatings, and as matrix to a 1 m wide vertical tuffisite vein. The vein occurs in a medium to coarse grained, orange to red, equigranular phase of the granite which has been exposed in the new woods road on the north side of Main Sops Arm River. Areas of white clay alteration of granite, up to 50 m wide, are also present in the new roadcuts.

Southwest Coast

Two months were spent working in the southwest part of the island investigating possible relationships between granitoid rocks and gold mineralization.

Samples were systematically collected from a number of different granitoid bodies on the southwest coast (Chorlton, 1978, 1980a,b, 1983) to provide additional background geochemical data. The Ordovician(?) Roti granite was sampled in the La Poile (110/9) map area (Roti West) and in the Peter Snout (11P/13) area (Roti East). The Devonian Chetwynd granite was sampled in the La Poile River (110/16), and Peter Snout map areas, and the Silurian(?) Ironbound, Peter Snout, and Rose Blanche plutons were sampled in the La Poile River and Peter Snout map areas. A relatively large number of geochemical analyses on the Silurian Hawks Nest Pond Porphyry and the Ordovician(?) Baggs Hill Granite has already been presented by Chorlton (1983b). This data may be of particular interest to companies exploring for gold in the southwest coast area.

The Ironbound Hills Syenite and the Peter Snout Granite are massive, essentially posttectonic, plutons and exhibit extremely high background radioactivity (to 1000 cps on an EDA 6RS 500 spectrometer). Uranium showings in the Baggs Hill Granite and in the Baie Du Nord Group (Wells, 1981; O'Brien and Tomlin, 1985) may be genetically related to these plutons.

Other areas that were briefly examined were the Cape Ray gold deposits and the Windowglass Hill Granite, the Diamond Cove Quartz Vein, pegmatite veins in the Rose Blanche Granite, the Nitty Gritty Brook Granite, tourmaline bearing quartz and pegmatite veins in Connoire Brook, uranium showings in the Baggs Hill Granite and in the Baie Du Nord Group, and the Cochrane Pond Granite.

The Cape Ray gold property occurs in a penetratively deformed sequence of bedded to laminated mafic tuff, silicic tuff and pyroclastic rocks, mafic volcanogenic sediment, and graphitic shale. It seems possible that these host rocks to the "Main Shear" gold deposits are part of a typical Ordovician - greenschist facies sedimentary-volcanic sequence which can be correlated with the Baie Du Nord Group and possibly with the Port Aux Basques Gneiss Complex (see Chorlton, 1983). In the author's opinion, the Devonian Windowglass Hill granite and accompanying stockwork and vein controlled hydrothermal system post dates the regional deformation (see Wilton, 1984). Lode gold mineralization related to granite emplacement is localized in graphitic horizons (Wilton, 1985).

These observations are significant with respect to the exploration potential for lode gold deposits in southwest Newfoundland in that they shift the emphasis from the Cape Ray Fault zone and contained Devonian rocks to graphitic schist zones in the Baie Du Nord Group that are in close proximity to granites. There are a large number of graphitic schist and shear zones, some of which contain quartz veining in the Baie Du Nord Group, many of which are cut by later granites. These crosscutting granites may have initiated the mineralizing process. The similarity in setting of the auriferous Diamond Cove Vein and the Main Shear lode gold deposits lends some support to the argument that lode gold deposits may be more widespread in southwest Newfoundland than previously recognized.

Acknowledgements

Jacob Lushman from Grey River is thanked for his capable and enthusiastic assistance during the summer.

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REGIONAL GEOLOGY - LABRADOR

THE COMPOSITION OF RHYOLITES OF THE UPPER AILLIK GROUP, LABRADOR: MAGMATIC AND POST-MAGMATIC "SIGNATURES"

by

Christine Payette and Robert F. Martin

Department of Geological Sciences, McGill University,
3450 University Street, Montreal, QC H3A 2A7

The composition of rhyolites of the Upper Aillik Group, Labrador: magmatic and post-magmatic "signatures".

- major-element geochemistry indicates highly evolved composition in terms of proportion of Na, K, Al, Si and buildup of incompatible elements.

- compositions are variable in terms of Na/(Na + K) value and SiO_2 content. These features are attributed to post-magmatic exchange of alkalis and deposition of silica. Similarly, some variability is evident in the ratio A/CNK.

- In this investigation, we intend to address the question: What was the composition of the magma? We intend to look for inclusions of glass (quenched melt) in the quartz phenocrysts of this suite. Such inclusions should provide direct information on the composition, Na/(Na + K) and A/CNK values of the magma. If the glass has escaped devitrification, the information does pertain to the magma. Some melt inclusions have been preserved, but the bulk of them has been devitrified as a result of cracking of the phenocrysts (during deformation). Magnetite is present in most of the inclusions that are still glassy.

- We also intend to rank the bulk rocks in order of disturbance from this primary composition. This can be done by comparing the disturbed bulk-compositions with that of the original magma. The proportion of albite and K-feldspar in the phenocrysts and groundmass will also provide us with a ranking of the rocks sampled in 1985. This work is in progress.

GEOLOGY OF THE SAND HILL RIVER AND BATTEAU 1:100,000 MAP AREAS

by

Charles F. Gower, Timothy Van Nostrand and Gordon McRoberts
Labrador Mapping Section

The Sand Hill River and Batteau map areas (13H/1, 2, 7, 8 and 3E/4, 5, 12) are located in eastern Labrador and encompass an area of about 6100 km2. The northern part of the region is underlain by hornblende-quartz diorite to hornblende-biotite granodiorite of the Earl Island domain of the Groswater Bay terrane. These rocks grade locally into K-feldspar megacrystic and granitic variants, and remnants of layered mafic intrusions are preserved in places. The rocks are heterogeneously strained and locally migmatitic.

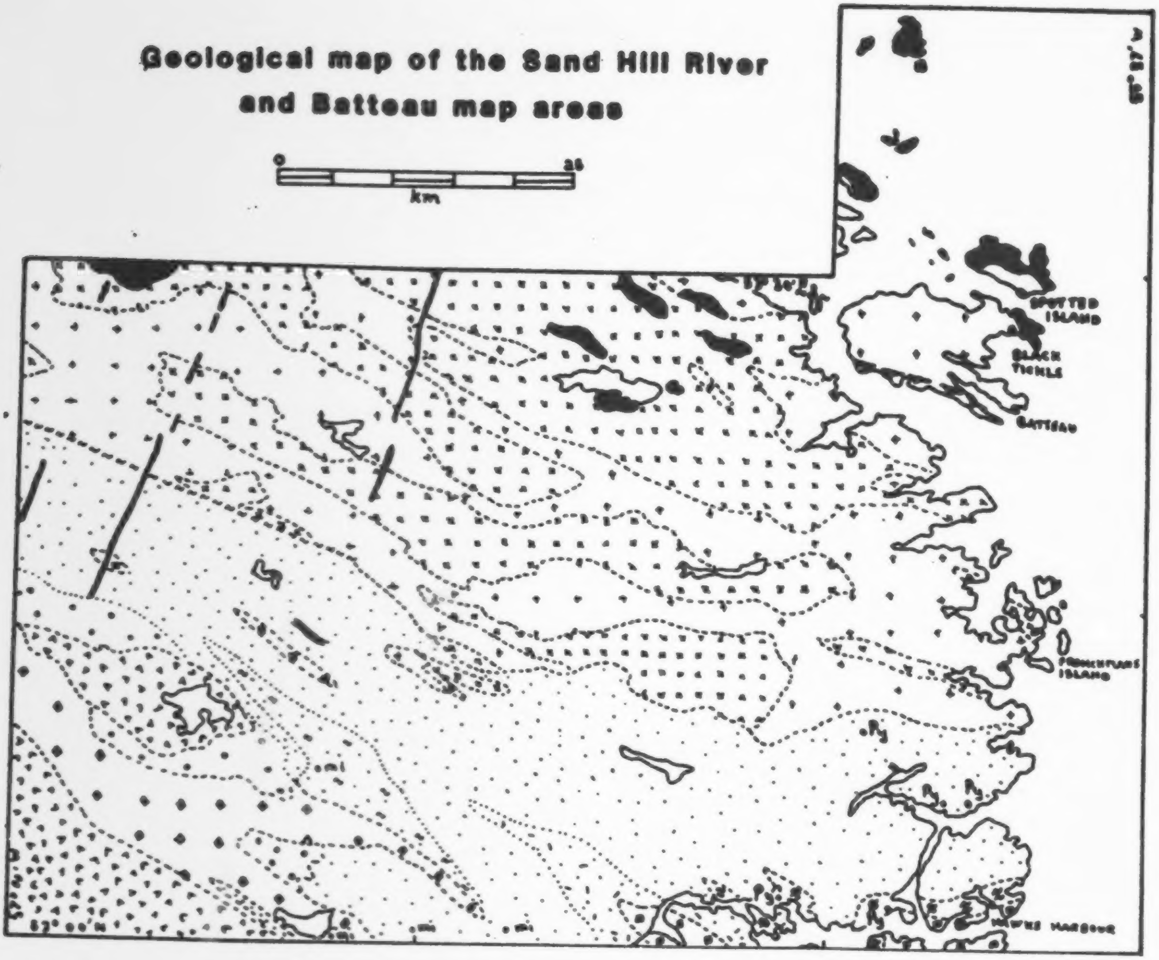
The central to southern part of the map area forms part of the Lake Melville terrane. It consists mostly of sillimanite-biotite metasedimentary gneiss which grades into muscovite and cordierite-bearing units in places. In the southwest portion of the area the metasedimentary gneiss takes on an anhydrous 'charnockitic' appearance. Calc-silicate rocks, meta-banded iron formation and quartzite are subsidiary supracrustal rocks. The metasedimentary gneiss is intruded by small K-feldspar megacrystic granitoid bodies; a somewhat larger granitoid body is present in the southeast corner of the map area. In the same area dioritic and granodioritic orthogneiss, interleaved with metasedimentary gneiss, is also found.

The southeast corner of the map area is underlain by layered gabbroid rocks of the White Bear Arm Complex. A smaller body with similar rock types is present within the metasedimentary gneiss farther north. Spatially associated with the White Bear Arm Complex, along its northern flank, is a K-feldspar megacrystic monzonite to granite.

Extensions to two known Late Proterozoic-Early Phanerozoic mafic dikes have also been mapped and another major dike of the same suite newly discovered in the central-north part of the area.

Indications of economic potential are confined to muscovite-bearing pegmatites and pyritic zones within metasedimentary gneiss. One muscovite-bearing pegmatite, 10 m wide and exposed for 50 m along strike, contains muscovite books up to 28 cm across. The pegmatites are locally garnet and tourmaline bearing, but do not show any anomalous radioactivity. Four new pyritic zones were discovered at coastal localities in the better-exposed southeast corner of the map area. All are at least several metres wide, buttheir strike length (suspected to be significant) is not fully known. Scintillometer readings give normal background values, with no anomalous radioactivity detected anywhere in the region.

Geological map of the Sand Hill River and Batteau map areas


0
25
km
SPOTTED ISLAND
BLACK TICKLE
BATTEAU
FRENCHMANS ISLAND
HAWKE HARBOUR
53°00'N
55°37'W
Py
mi

PHANEROZOIC

/ Mafic dykes

HELIKIAN OR OLDER

● Unassigned meta-gabbro, amphibolite

+ + Biot. hbl. granodiorite to granite

▪ ▪ Biot. hbl. qtz. diorite to diorite

▫ ▫ K-fs. megacrystic granitoid rocks

Qtz. diorite to diorite gneiss

HELIKIAN OR OLDER (Continued)

◇ ◇ K-fs. megacrystic monzonite to granite

Gabbro, leucogabbro (White Bear Arm Complex)

Sill. - biot. pelitic gneiss

Musc. bearing pelitic gneiss

Cord. - sill. pelitic gneiss

• • Sill. - opx. - magt. 'anhydrous' pelitic gneiss

Quartzite

▼ ▼ Thrust

~~~~~ Fault

Geological boundary;
------- approximate
.... gradational

•Py Pyrite

•mi Mica (muscovite)
~~~~~

GEOCHEMISTRY AND MINERAL POTENTIAL OF THE GRANITOID ROCKS OF THE TRANS-LABRADOR BATHOLITH IN COASTAL LABRADOR

by

Andrew Kerr
Labrador Mapping Section

Introduction

The purpose of this project is to assess the mineral potential of a wide range of granitoid rocks in the eastern Central Mineral Belt and also to develop an understanding of the evolution and petrogenesis of the Trans-Labrador Batholith, a major Palaeohelikian intrusive province transecting central Labrador (Figure 1).

The 1985 field season was devoted largely to the completion of an extensive helicopter-supported lithogeochemical survey covering approximately 5000 km^2 (Figure 1). Limited ground fieldwork was carried out in coastal areas and within several small intrusive bodies with known or suspected associated mineralization. Other activities this year included computer compilation and statistical analysis of lake sediment geochemical data, and collection of large samples for U-Pb zircon dating of various units.

This summer's work has resulted in the collection of a large amount of data from a very large area and much of the winter will be devoted to interpretation and synthesis.

Geology

A simplified geological map of the area (compiled from Gower, 1981; Gower et al., 1982; and Ryan, 1985) is shown in Figure 1. In a general way, rocks in the area are grouped into four broad subdivisions:

(1) Archean basement gneisses remobilized extensively during Lower Proterozoic orogenic events.

(2) Lower Proterozoic supracrustal rocks (Aillik Group), consisting of mafic volcanics, assorted metasediments and a thick sequence of felsic volcanic and volcaniclastic rocks (see legend for details).

(3) Foliated to gneissic granitoid rocks which intrude the Aillik Group and appear to be pre or syntectonic with respect to the deformation of the group.

(4) Widespread posttectonic intrusive rocks of highly variable composition and texture which form the eastern extremity of the Trans-Labrador batholith (see legend for details).

The boundary between the Makkovik Province and the Grenville Province is a system of shear zones and reverse faults. South of this zone, intrusive rocks of all ages develop strong east-west trending fabrics which obliterate many of their primary features.

Limited geochronologic data suggest that the older suite of granitoids is approximately 1850 Ma old, and the younger granitoids were intruded between 1675 and 1625 Ma. Geological mapping by the Mineral Development Division and various mining companies has to date concentrated mostly on the Aillik Group (which hosts subeconomic U and Mo deposits); consequently the characteristics ofthe granitoid rocks are very poorly known. Some broad subdivisions have been suggested on the basis of petrologic or radiometric data (see map legend), but there is as yet no systematic database to allow definition of individual plutons or magma sequences. In the Makkovik area, map patterns suggest that the erosion surface cuts the upper surface of the batholith and several small granite bodies are associated with F, Mo and base-metal mineralization around their margins. Mo mineralization is also reported in inland localities (see Figure 1) and lake sediment geochemical surveys (McConnell, 1984, and unpublished work) reveal significant Zn, Mo, Pb, Ag and As anomalies in areas underlain by posttectonic granitoids. Interest in the economic potential of the area has been re-awakened by recent Au discoveries (Wardle and Wilton, 1984) and this project should eventually provide an assessment of the area's potential for granophile mineral deposits.

Mapping conducted concurrently with the lithogeochemical survey discussed below has revealed a great variety of intrusive rocks ranging in composition from hornblende-peridotites to alkali feldspar granites and syenites. The distribution of rock types is in many areas radically different to that indicated by previous mapping and compilation. A revised map will be presented as part of Current Research Report 86-1.

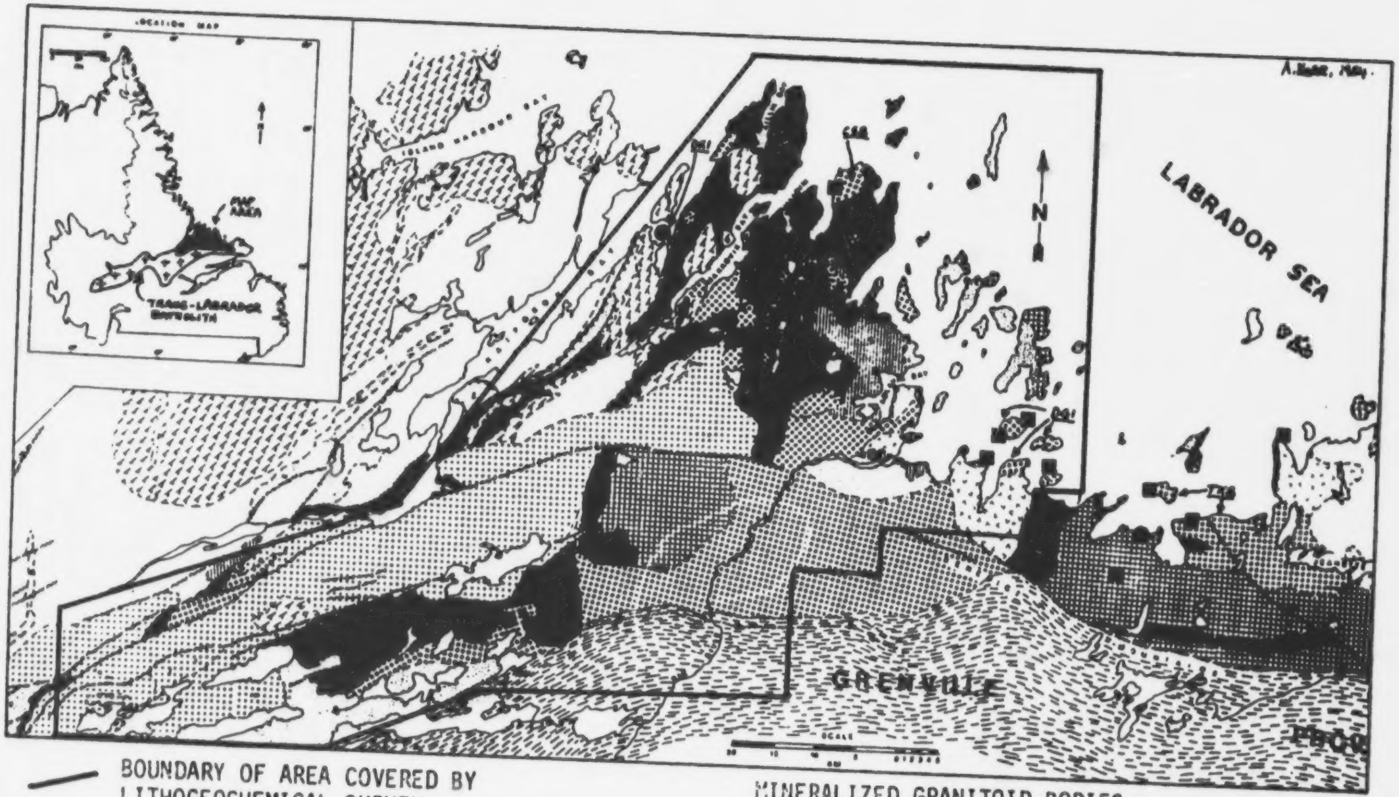
Compilation and Analysis of Lake Sediment Geochemical Data

Reconnaissance lake sediment geochemical data for the entire eastern Central Mineral Belt (approximately 1500 samples) has been amalgamated into a single large computer file and treated with a variety of statistical tecnniques, including regression and factor analysis. Data have been presented in the form of symbolic maps at 1:250,000 scale which show raw data, residual data and factor scores. These results will be discussed in more detail in a separate report and maps will eventually be made available as an open file release in 1986. Data interpretation is only partly completed, but results confirm previously noted anomalies and also suggest several new anomalous areas within both granitoid and supracrustal terranes.

Lithogeochemical Survey

The principal objective for the 1985 season was to complete lithogeochemical sampling over about 5000 km2 of the batholith. The area covered this year is shown in Figure 1. A grid cell approach was used with 2 km x 2 km cells delineated by the UTM grid; samples were collected as close as possible to locations preselected on a random basis within each cell. Most grid cells contain a single sample location, but grid cells which straddle geologic contacts were sampled in two or more locations on either side of the contact(s). Over 90 percent of the grid cells contained outcrop suitable for sampling and a total of 656 bulk samples were collected. Field data and macroscopic characteristics of all samples have been coded for construction of a preliminary computer database. Petrographic data will be available later this year and will also be coded for inclusion in the database.

Sample preparation is currently underway and all samples will be analysed initially for major elements, Ba, Rb, Sr, Zr, F, Cu, Zn, Mo, Pb, Ni, Cr, Li, V and Ag. Subsequent analysis for additional trace elements and ore elements such as Sn, W, Nb, Ta, Au, and REE will be based on results from the first phase and concurrent petrographic research.


LOCATION MAP
MAP AREA
TRANS-LABRADOR BATHOLITH
LABRADOR SEA
N
CSB
DKI
TKB
GRENVILLE
SCALE
A. Kerr, 1984

— BOUNDARY OF AREA COVERED BY LITHOGEOCHEMICAL SURVEY

- ● Molybdenite mineralization
- ■ Fluorite mineralization

MINERALIZED GRANITOID BODIES

BTL -- Burnt Lake granite
DKI -- Duck Island granite
MKH -- Monkey Hill granite
CSB -- Cape Strawberry granite
DGI -- Dog Islands granite
TKB -- Tukialik Bay granite

LEGEND

MAKKOVIK PROVINCE

ARCHEAN BASEMENT AND REACTIVATED ARCHEAN

- □ QUARTZOFELDSPATHIC GNEISS, GRANITOID GNEISS AND AMPHIBOLITE.

APHEBIAN SUPRACRUSTAL ROCKS

- ░ LOWER AILLIK GROUP AND MORAN LAKE GROUP: QUARTZITE, GRAYWACKE AND MAFIC VOLCANIC ROCKS.
- ■ UPPER AILLIK GROUP: ARKOSE, CONGLOMERATE, FELSIC VOCANIC AND PYROCLASTIC ROCKS.

HELIKIAN SUPRACRUSTAL ROCKS

- ▒ BRUCE RIVER GROUP: ARKOSE, CONGLOMERATE, SANDSTONE, MAFIC TO FELSIC VOLCANIC AND PYROCLASTIC ROCKS.

SYNKINEMATIC (MAKKOVIKIAN) INTRUSIVE ROCKS

- ▧ FOLIATED TO GNEISSIC QUARTZ MONZONITE, GRANODIORITE AND GRANITE.

TRANS-LABRADOR BATHOLITH AND PRESUMED EQUIVALENTS

- ▥ ADLAVIK INTRUSIVE SUITE AND PROBABLE EQUIVALENTS: LAYERED PYROXENITE, GABBRO, DIORITE AND MONZODIORITE.

BENEDICT MOUNTAINS AND NIPISHISH LAKE INTRUSIVE SUITES

- ░ DOMINANTLY MONZONITE AND QUARTZ MONZONITE.
- ◠ DOMINANTLY GRANODIORITE.
- ▦ DOMINANTLY SYENITE AND QUARTZ SYENITE.
- ● DOMINANTLY GRANITE AND-ALKALI FELDSPAR GRANITE.
- ✦ UNDIVIDED GRANITOID INTRUSIVE ROCKS.

GRENVILLE PROVINCE

- ▤ FOLIATED TO GNEISSIC GRANITOID INTRUSIVE ROCKS, PROBABLY DEFORMED AND METAMORPHOSED EQUIVALENTS OF THE TRANS-LABRADOR BATHOLITH.

- – – – GEOLOGICAL CONTACT
- 〰 FAULT
- ▼▼▼ THRUST FAULT
- ······· LIMIT OF MAPPING

Geochemical data will be made available as part of an open file release in 1986.

Geological Work

Several small granitoid bodies which are associated with mineralization or considered to have potential for mineral deposits (see Figure 1) were visited and sampled on a closer spacing than that of the regional survey. Samples of mineralized and altered granite were collected to provide reference suites to aid in the interpretation of the regional lithogeochemical data. Limited prospecting did not reveal any new areas of significant mineralization but these plutons will be investigated in more detail next year if the geochemical data prove favourable.

Some coastal field work was conducted in the Adlavik Islands area in order to collect reference suites from various intrusive units and also to attempt clarification of field relationships between different components of the batholith.

Geochronology Sampling

A number of bulk samples were collected during the summer for U-Pb dating using zircon separates. These include all intrusive units whose relative contact relationships are known, and also units which are recognizable over significant areas of the batholith.

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GNEISSES, ANORTHOSITES AND GRANITES OF THE ANAKTALIK BROOK - KOGALUK RIVER AREA, LABRADOR (14D/1,8)

by

Bruce Ryan and Dan Lee
Labrador Mapping Section

The 1985 field season was the first of a 4-year program to investigate an 80 km wide, east-west corridor from coastal Labrador near Nain to Strange Lake on the Quebec border (Figure 1). One of the chief objectives of this program is to re-evaluate granitic rocks in the area for possible specialized granites such as the peralkaline intrusives around Flowers Bay (Hill, 1982) and at Strange Lake; the latter host a high concentration of rare earth elements, zirconium and beryllium (Currie, 1985).

The area mapped during the 1985 season contains no peralkaline intrusive rocks. However, our work has shown that the only existing geological map of the area, that of Taylor (1977), is not adequate as a data base because of its reconnaissance nature. Our results (Figure 2) differ significantly from those of Taylor, especially in our recognition of an areally extensive unit of norite and monzogabbro, which was emplaced in temporal sequence between the anorthositic and granitic rocks of the Elsonian plutonic assemblage.

An outline of the main subdivisions shown on Figure 2 is as follows:

1. Nain Province - Gneisses considered to be Archean in age crop out in the northeast section of the map area. These comprise amphibolite to granulite grade migmatites containing mafic and metasedimentary units of supracrustal origin. Meta-anorthosite forms part of the Archean complex south of Anaktalik Brook mouth and north of Voisey Bay.

2. Churchill Province - Most gneisses of the Proterozoic block display a strong mylonitic foliation. They include white garnet-quartz-feldspar gneiss and hypersthene tonalite gneiss, identical to those which form the easternmost part of the Churchill Orogen in the Saglek area (Ryan et al, 1983). Also present are cordierite-rich, granulite facies paragneisses, migmatitic biotite gneisses with rusty zones of probable metasedimentary origin, and a variety of white to pink, highly deformed, locally porphyritic granites which give rise to granitic gneisses and augen gneisses. Granulite grade conditions prevail in the east and north, but the amphibolite facies predominates in the southwest. The garnet bearing rocks display garnet to cordierite reaction adjacent to younger plutons.

3. Anorthosite Suite - Gabbro, troctolite, and anorthosite have their greatest areal extent in the northern part of the area. Most of the rocks of this type exposed in the area are cumulate zone leucocratic members. North of Voisey Bay, however, a gently dipping monoclinal layered complex, containing dunite and olivine gabbro lower units and an uppermost unit of black anorthosite, intrudes Archean gneisses.

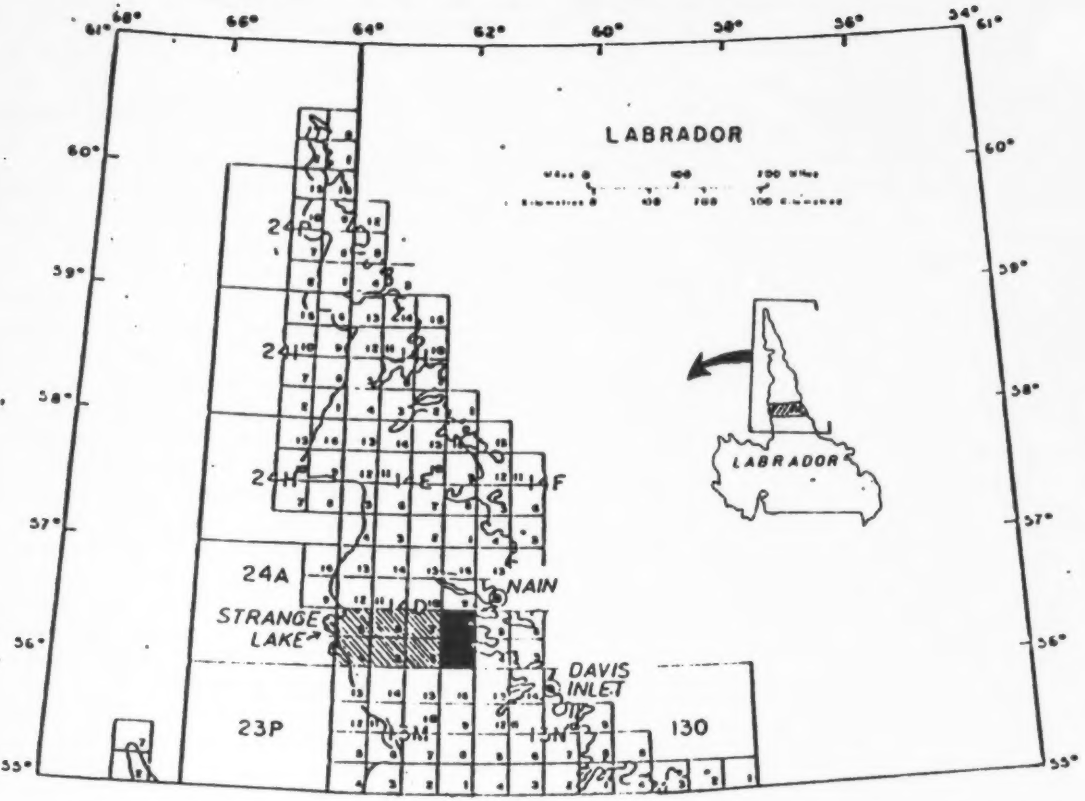
68°
66°
64°
62°
60°
58°
56°
54°
61°
60°
59°
58°
57°
56°
55°
LABRADOR
24P
24I
24H
14E
14F
24A
14D
STRANGE LAKE
NAIN
DAVIS INLET
23P
13M
13N
130
LABRADOR

Figure 1: *Location of Nain-Strange Lake project corridor. Area outlined in black shown in Figure 2.*

Legend and Key for Figure 2

Nain Province

1 Undivided, banded, gray gneiss and amphibolite, minor paragneiss, la, meta-anorthosite and meta-leucogabbro

Churchill Province

2 Garnet-quartz-feldspar (mylonitic) gneiss
4 Metasediments
6 White granitic gneiss
8 Undivided gneisses including augen gneiss and pink granitic gneiss
9 Cordierite-rich granulite (paragranulite)

3 Hypersthene gneiss
5 Gray biotite gneiss
7 White silicious gneiss, garnet bearing locally

Intrusive Rocks

10 Anorthosite-gabbro-troctolite; 10a, border zone ultramafic rocks
11 Monzogabbros, quartz-feldspar porphyry dikes, minor monzonite-granite
12 Granitic rocks: hbl. = hornblende granite and related porphyry (por.)
ra. = rapakivi granite

Geological boundary : defined, assumed
Gneissic foliation : inclined, vertical

Faults :

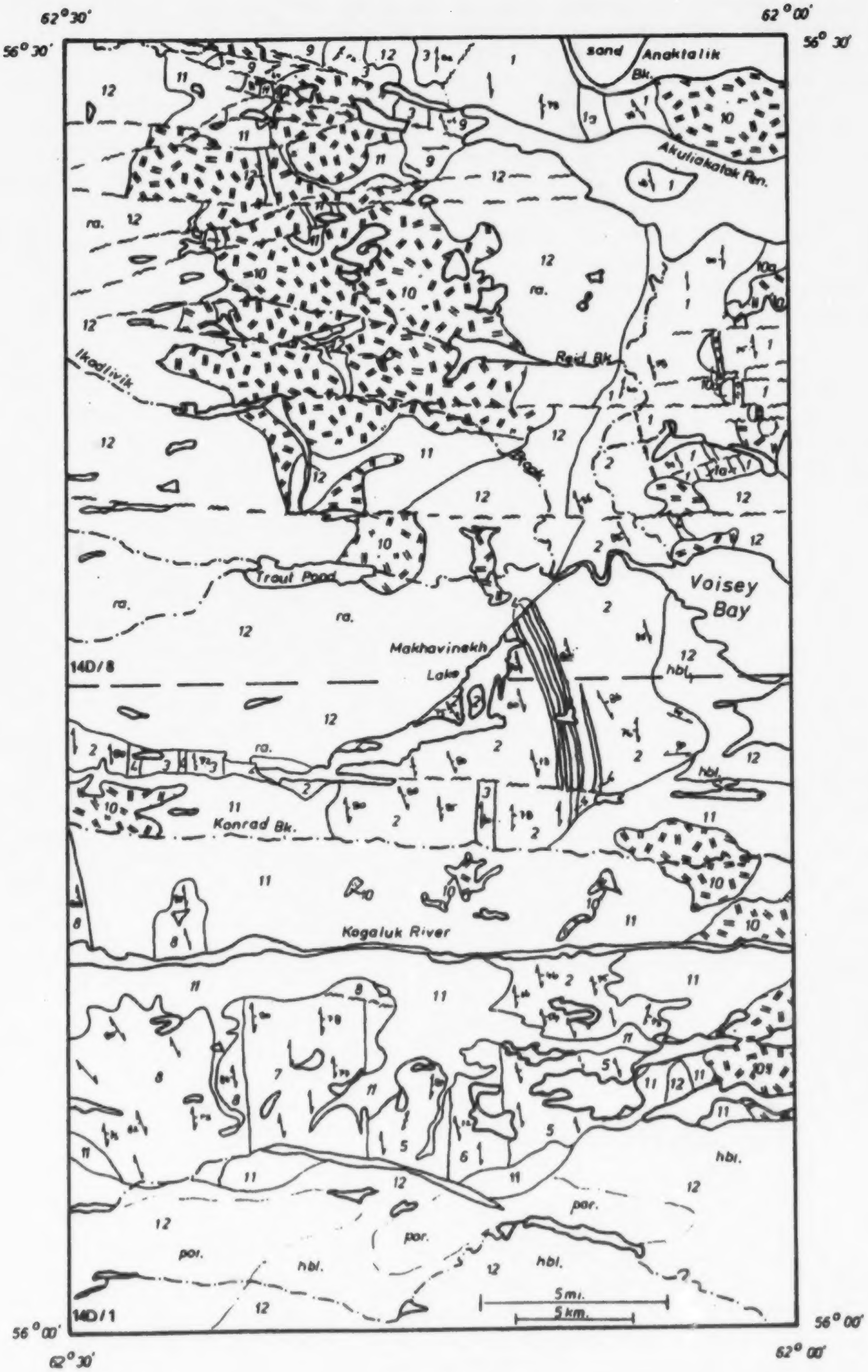
62°30'
62°00'
56°30'
56°30'
sand
Anaktalik Bk.
Akuliakatak Pen.
Reid Bk.
Ikadlivik
Brook
Trout Pond
Voisey Bay
Makhavinekh Lake
14D/8
Konrad Bk.
Kogaluk River
ra.
hbl.
por.
5 mi.
5 km.
14D/1
56°00'
56°00'
62°30'
62°00'

Figure 2: Geological sketch map of the Anaktalik Brook - Kogaluk River area (14D/1,8)

4. Norite, Gabbro and Monzogabbro - These form approximately 80% of the area between Konrad Brook and Kogaluk River. They form a sheath between gneisses and anorthosite; anorthosite rafts varying from several centimetres to several kilometres in size occur in this intrusion, and several large dikes of monzonitic, feldspar (± quartz) porphyry emanate from it to the south. North of Ikadlivik Brook, similar rocks form a less-extensive area and locally have transitional contacts with either gabbros of the anorthosite suite or rapakivi granites, even though the latter also intrude the monzogabbroic rocks.

5. Granites - Rapakivi texture characterizes most of the granitic rocks north of Makhavinekh Lake where one pluton totally envelopes a gabbro- anorthosite body. South of the Kogaluk River, a hypidiomorphic hornblende granite containing a quartz-feldspar porphyry phase intrudes gneisses, anorthosite, and monzogabbro.

Rusty paragneiss zones in the Proterozoic gneisses contain abundant graphite and iron sulfides. Locally, the anorthosites have areas with blue-green labradorite schiller, and some gabbroic members have rusty sulfide-rich zones. No mineralized areas were found in the granites of the map area.

More details of the 1985 program will be forthcoming in Current Research, Report 86-1, and 1:50,000 scale geological maps with marginal notes will be published in 1986.

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THE REGIONAL GEOLOGY OF 23A (LAC JOSEPH) SOUTHEAST AND PARTS OF 22P (LAC FOURNIER) NORTHEAST, SOUTHWESTERN LABRADOR AND QUEBEC

by

G.A.G. Nunn, R.F. Emslie[1], N. Noel[2], C.E. Lefebvre[3] and S. Wells[4]
Labrador Mapping Section

Introduction

The area covered consists of map sheets 23A/1, 2, 7 and 8, 22P/15, most of 22P/16 and those parts of 22P/9 and 10 that occur in Labrador. The mapping was undertaken as a joint project by the Geological Survey of Canada and the Newfoundland Department of Mines and Energy.

The area was previously mapped and compiled at 1:250,000 by Stevenson (1967, 23A southeast) and Sharma and Franconi (1975, the Quebec portion of 22P northeast).

Geology

Regional Geology

The map area is divided into three primarily physiographic regions, each with its own lithologic associations (Figure 1). The northwestern region (a) of lowlands and several small upland areas is underlain by upper amphibolite to granulite facies paragneiss intruded by a gabbronorite suite and granitoid rocks. The upland areas are generally underlain by granulite facies or basic plutonic rocks, whereas the low lying areas are underlain by amphibolite facies or granitoid rocks.

The central region (b) spans the map area from northeast to southwest and is a predominantly upland terrain underlain by anorthosite-related rocks and an associated pyroxene-bearing monzonite suite. In the southwest of this region, there is an area of granulite facies paragneiss that lies structurally above the anorthosite. The central region is known as the Atikonak River massif.

The southeastern region (c) is an area of lowlands and low, rounded, glacially-sculptured ridges that is underlain by a gabbronorite body and its amphibolite facies equivalents. It also includes a suite of granitoid rocks that intrude the amphibolites and occupy most of the eastern part of this region. Minor amounts of paragneiss occur in this region.

Unit Descriptions

1. Paragneiss. Paragneiss is the oldest rock type in the area. In the northwest (1a), it consists mostly of granite-layered migmatites with an aluminous restite dominated by sillimanite and opaque oxides. This pelitic to semipelitic paragneiss contains layers of psammitic gneiss and either two-pyroxene metabasic rock or amphibolite. Paragneisses of

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[1] Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario K1A 0E8.

[2] Department of Earth Sciences, Memorial University of Newfoundland, St. John's, Newfoundland A1B 3X5.

[3] 555 Boulevard Université, Chicoutimi, Québec.

[4] 22 Boyle Street, St. John's, Newfoundland A1E 2H2.

LEGEND

Unit

5 Acid plutonic rocks
- a K-feldspar megacrystic and equigranular to seriate-textured granitoid rocks.
- ab Rapakivi-textured quartz monzonite and quartz syenite.
- b Blue quartz-bearing, K-feldspar porphyritic to megacrystic granite.
- c K-feldspar megacrystic quartz monzonite to granite, equigranular granite, and K-feldspar ± plagioclase porphyritic microgranite.

4 Monzonite, quartz monzonite, ferrodiorite.

3. Anorthosite-related rocks: predominantly troctolite, leucotroctolite, anorthosite, leuconorite and norite, Beaver Pond Gabbro (BPG).

2. Basic plutonic rocks
- a Leuconorite, leucogabbronorite, leucogabbro, gabbro and quartz leucogabbronorite.
- b Leuconorite and leucogabbronorite, minor gabbro and anorthosite.
- c Leucogabbronorite and amphibolite, minor granitoid - layered, tonalitic gneiss.

1. Paragneiss
- a,b,c Semipelitic to pelitic gneiss, minor layers of psammitic gneiss and supracrustal basic gneiss.

X Oxide concentration.

L Labradorite.

BPG Contains oxide and sulfide concentrations.

NOTE: a, b and c refer to physiographic regions described in the Regional Geology section. All boundaries are either approximate or arbitrary, all faults are assumed.

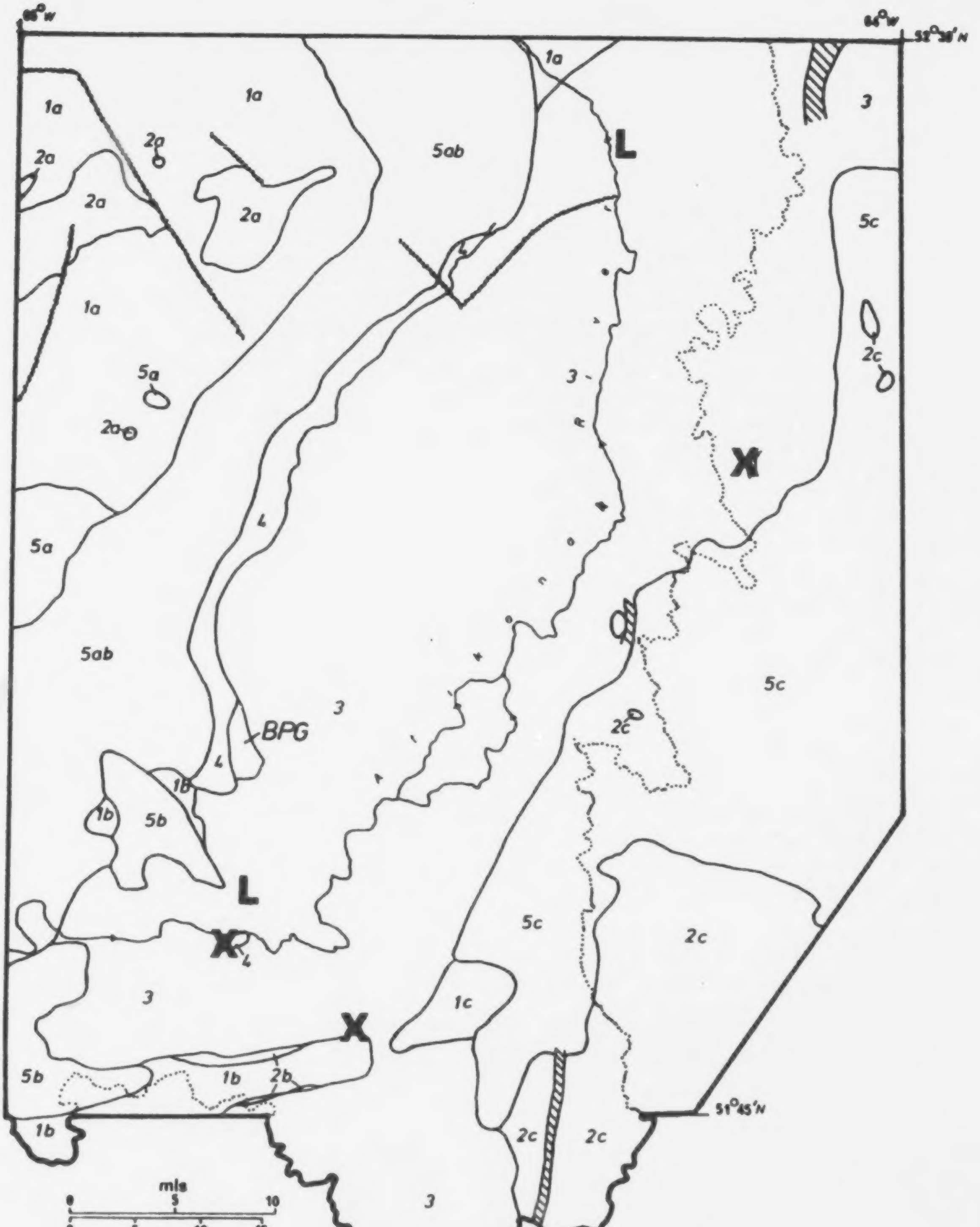
66°W
65°W
52°30'N
1a
1a
1a
1a
2a
2a
2a
2a
5ab
L
3
5c
2c
3
5a
2a
X
5a
5ab
L
BPG
3
1b
1b
5b
5c
2c
L
X
L
3
X
5c
2c
1c
5b
1b
2b
1b
51°45'N
2c
2c
3
mls
0
5
10
0
5
10
15
kms
▨ Shear zone

Figure 1: *General geology of map area.*

granulite and upper amphibolite facies are similar but the latter is more likely to be biotite-rich, garnet-bearing or more coarsely crystalline.

The paragneiss overlying the anorthositic rocks (1b) consists of orthopyroxene and sillimanite-bearing migmatite interlayered with a similar looking gneiss in which sillimanite has not been recognized. The latter rock may be an orthogneiss. Cordierite occurs near the northern margin of the paragneiss and appears to be spatially associated with the anorthositic rocks; this paragneiss may be a large roof pendant.

Farther north are smaller areas of lower grade sillimanite-bearing paragneiss that contain numerous sheets of granitoid migmatite.

The paragneiss in the southeast (1c) is of upper amphibolite facies aspect (cp. 1a) and locally occurs as inclusions in granitoid rocks (5c).

2. Plutonic metabasic rocks. The northwestern suite (2a) consists of leucogabbronorite and leuconorite with variations that include orthopyroxene-bearing quartz dioritic compositions. Gabbro and leucogabbro are also present. The gabbronorites are rarely layered, contain numerous cognate inclusions, some of which may be disrupted dikes, and are intrusive into metabasic supracrustal rocks (1a). A strip of layered leucogabbronorite (2b) occurs between the paragneiss (1b) and the anorthositic rocks (3). In the southeastern region (2c), a southern area is underlain by a layered gabbronorite body with amphibolite dikes. Northwards the body is more deformed, is metamorphosed in the amphibolite facies, and ranges from foliated amphibolite to a tonalitic gneiss.

3. Anorthosite-related rocks. Most of the northwestern area of the anorthositic rocks is composed of layered troctolite (colour index 25-50), leucotroctolite (10-25) and anorthosite (10). Many of these rocks also contain an igneous lamination. In the eastern part of the Atikonak River massif, layered, but unlaminated, and commonly very coarse grained norite and leuconorite predominate. These rocks grade into anorthosite containing red-brown plagioclase in the northeast corner of the map area. To the southwest, the layered troctolitic association occurs with very coarse grained norite, anorthosite containing a light gray plagioclase, and a layered body containing two-pyroxene and olivine gabbros (Beaver Pond gabbro), all of which may be separate, ?younger, intrusions.

The anorthosite-related rocks contain examples of multiple intrusion, e.g., dikes and xenoliths, and of igneous sedimentation features, e.g. layering, lamination and slump folds. Commonly the ferromagnesian minerals have been altered with either the development of dark green clinopyroxene-spinel coronas, or with replacement by hydrous minerals (amphiboles and biotite), commonly also in corona form.

4. Monzonite and related rocks. A strip of orthopyroxene-bearing monzonite (4) occurs adjacent to the anorthositic rocks along the northwestern margin of the Atikonak River massif. In places it grades through quartz monzonite into granite with quartz contents of up to 30 percent. The monzonite locally contains rapakivi-textured feldspars and may grade into the rapakivi-textured granitoid rocks that occur in the boundary zone between the northwestern and central regions (5ab). The monzonites intrude unit 3.

A small area of ferrodiorite occurs within the anorthositic rocks in the southwestern part of the massif (4). It is layered and characterized by high oxide percentages. The ferrodiorite is probably related to the monzonite.

5. Granitoid plutonic rocks. On the western edge of the map area, foliated, K-feldspar megacrystic granitoid rocks intrude the paragneiss, and associated with them are seriate to equigranular-textured, non-megacrystic rocks (5a). These rocks are not rapakivi-textured and their relationship to 5ab is unknown.

The rapakivi-textured granitoid rocks (5ab) occur in the western part of the Atikonak River massif (5b), where they are mostly undeformed, and across the boundary between the northwestern and central regions, where they are variably recrystallized and foliated, and the rapakivi texture is commonly indistinct.

The amphibolites in the east (2c) are intruded by a suite of granitoid rocks that include K-feldspar megacrystic granite, quartz monzonite and quartz syenite, K-feldspar and plagioclase porphyritic microgranite, and fine to coarse grained granite (5c). Rocks in the suite are either undeformed, or foliated, or gneissic.

Medium to coarse grained, K-feldspar porphyritic to megacrystic granites occur in the southwestern part of the map area (5b). The granites are orthopyroxene-bearing and typically the quartz is blue. They intrude the anorthosite-related rocks (3).

Structure and metamorphism

The metasedimentary rocks were deformed and metamorphosed to migmatite grade prior to emplacement of plutonic suites 2a, 3 (if the 1b paragneiss includes cordierite-bearing hornfels), 5a and 5c. In the northwest, the paragneiss (1a) and plutonic rocks (2a, 5a, 5ab) were subsequently deformed together and all rocks underwent partial to complete recrystallization, commonly with the development of axial planar fabrics to tight folds in the paragneiss. The deformation affecting the rapakivi-textured granitoid rocks (5ab) dies out southeastwards towards the anorthosite; the various topographic levels at the northwestern edge of the Atikonak River massif seem to be related to varying degrees of deformation within this unit.

In the southeast, the gabbronorite was deformed and metamorphosed to amphibolite facies before emplacement of the granitoid suite (5c), which also intrudes the eastern margin of the anorthositic rocks. The granitoid suite exhibits very narrow strain gradients from undeformed (locally, in marginal, probably strain-protected areas near the amphibolite and anorthosite contacts) to strongly foliated or migmatitic throughout most of the eastern area.

Evidence for major ductile shearing was observed locally in eastern parts of the map area; this shearing is interpreted to form a continuous shear zone which crosses the area in a roughly north-northeast trending direction. The shear zone partly follows the eastern margin of the anorthositic rocks but also transgresses into both the anorthosite in the north and the gabbronorite in the south. Both the shear zone and the granitoid gneisses are folded and the orientations are consistent with the possibility of north-northwest-trending axial traces (typical later Grenville trends).

Despite involvement in an amphibolite facies dynamothermal regime, the anorthositic rocks are affected to only a minor degree, except in the shear zones where polygonal recrystallization and deformation are much greater than in the massif as a whole.

The ambient grade of regional metamorphism throughout the southeastern areas was in the amphibolite facies for all events; in the northwest it varied from the amphibolite to the granulite facies. It is not known whether this change occurs at a simple facies boundary or across structural breaks.

At present there are no firm age dates constraining these events. The anorthositic rocks yielded a preliminary Sm-Nd errorchron of circa 1645 Ma (C. Brooks, personal communication, 1985). The plutonic and tectonic features of the area may either belong to one or more of the events already described from this region of Labrador (e.g. Grenvillian, Elsonian, Labradorian), or to as yet undocumented diastrophism.

Economic Geology

The anorthosite-related rocks contain numerous minor examples of chatoyant labradorite. The irridescence occurs in both the primary feldspars and in the recrystallized rocks. Oxides occur throughout the body as intergranular and intercumulus phases and are also concentrated in pods or layers up to 1 m thick. The ferrodiorite is also rich in oxide minerals. The Beaver Pond gabbro contains both oxide and sulphide concentrations.

Acknowledgements

We wish to thank B. Kjarsgaard, H. McCleave, M. Rice, R. Sherlock, J. Smyth and G. Wiseman for field assistance. Logistical help was much appreciated from M. Grechan of Viking Helicopters, G. Wiseman, W. Tuttle, K. O'Quinn, W. Ryder and the people and company of Churchill Falls, Labrador.

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GEOLOGY OF THE GOOSE BAY - GOOSE RIVER MAP AREA (13F/8, 13F/7)

by

R.J. Wardle and C. Ash
Labrador Mapping Section

The map area is located at the western end of Lake Melville and lies within the interior of the Grenville Structural Province. Convenient access is available from the town of Happy Valley - Goose Bay and a network of forest roads covering much of the area.

The eastern half of the area and much of the lowlands along the Churchill and Goose Rivers are blanketed by thick deposits of Pleistocene outwash sand.Exposure in the remainder of the area is poor to moderate.

The northwestern part of the area is underlain by heterogeneous gray granitoid gneisses (Unit 1) interfolded with metasedimentary gneisses (Unit 2) in complex interference patterns. To the east these gneisses are in unexposed contact with rocks of a major anorthositic suite forming the southern part of the Cape Caribou River Allochthon. This suite comprises an interior anorthosite massif (Unit 3) and a western border zone of layered metagabbro (sensu lato) and amphibolite, intruded by abundant, concordant sheets of monzonitic and syenitic rocks of Unit 8. A small body of anorthosite also occurs as an enclave in younger granitic gneisses near the western edge of the map area.

The southern part of the map area is underlain by a variety of granitoid rocks. In the east these comprise massive to weakly deformed, monzonitic and syenitic rocks (Units 6, 7 and 8) containing large enclaves of amphibolite and metagabbro (sensu lato) which show local textural and compositional similarity to rocks of the anorthosite border zone (Unit 4).

Small, isolated bodies of moderately deformed granite (Unit 9) also occur in the drift covered ground near the western margin of the anorthosite.

To the west the monzonitic and syenitic lithologies pass into the more strongly foliated and gneissic granitic rocks of Unit 10. This is a texturally heterogeneous unit ranging from foliated granites and syenites to migmatitic granitic and syenitic gneisses, and locally preserves evidence of granulite facies metamorphism. All varieties contain abundant interlayers and enclaves of amphibolite.

The gneisses of Units 1 and 2 are probably among the earliest units in the area; similar rock types to the northeast and west having given intrusive and metamorphic ages of circa 1650 Ma. The age of the remaining rock units in the area is unknown, other than that they predate the Grenvillian orogeny of circa 1000 Ma.

The degree of deformation and metamorphism, as exemplified by the development of gneissic and migmatitic textures, increases from east to west and to a large extent probably reflects variations in Grenvillian tectonic style. Locally, however, the granitic rocks of Unit 10 intrude gneissic rocks of Unit 1, indicating at least the local presence of pre-Grenvillian fabrics.

Mineralization is restricted to minor occurrences of ilmenite in metasedimentary gneiss of Unit 2 and to magnetite concentrations along the western margin of the anorthosite massif. Magnetite mineralization is probably responsible, at least in part, for a pronounced aeromagnetic anomaly which extends along the western edge of the anorthosite and into the drift covered ground around the Goose Bay military base.

LEGEND

10 Foliated pink granite and granitic gneiss; 10a-Foliated pink syenite, syenitic gneiss and minor megacrystic granitoid. Both 10 and 10a contain abundant interbands of amphibolite and minor interralations of gray granitoid gneiss.

9 Foliated, pink to white, granite to quartz monzonite with amphibolite inclusions.

8 Massive to foliated, gray to buff, monzonite and syenite, together with quartz bearing varieties, and lesser granite. Contains abundant large amphibolite metagabbroid and lesser ultramafic rock inclusions.

7 Massive to weakly foliated, buff, quartz syenite to syenite and lesser granite. Contains abundant amphibolite-metagabbroid inclusions (a).

6 Massive to strongly foliated, gray, monzonite to monzodiorite together with quartz bearing varieties and minor granite. Contains abundant large inclusions (a) of amphibolite, metagabbroid and minor ultramafic rocks.

5 Foliated, gray, megacrystic granitoid.

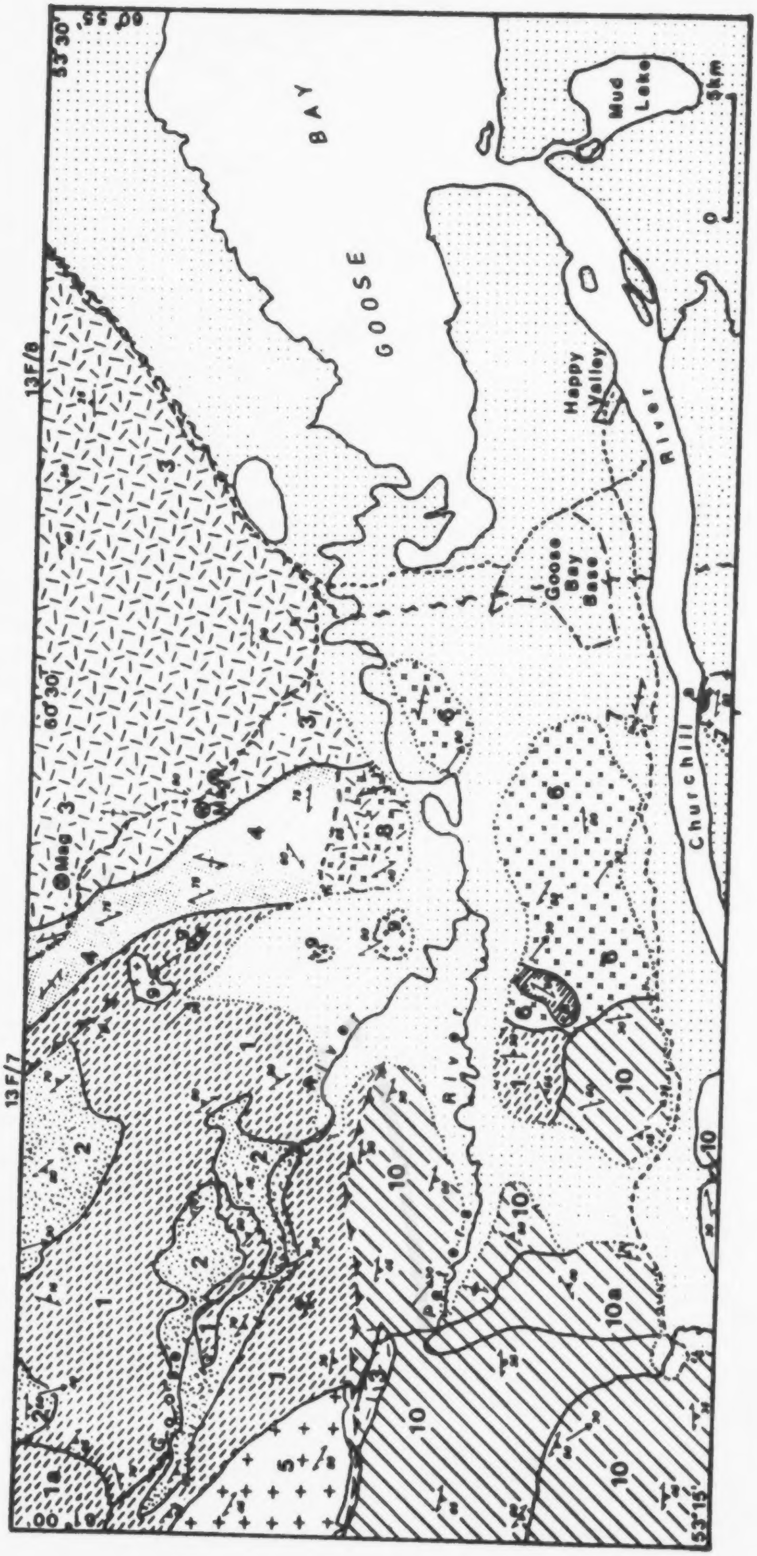
4 Intrusive complex comprising metagabbroid rocks, minor ultramafic rocks and amphibolite equivalents, sheeted by monzonitic, syenitic and lesser granitic rocks of unit 8.

3 Anorthosite, leuconorite and leucotroctolite; minor norite.

2 Migmatitic, quartz + feldspar + biotite + sillimanite metasedimentary gneisses.

1 Gray banded and migmatitic granitoid gneisses of tonalitic to granodioritic composition, containing abundant inclusions of amphibolite.

1a - Foliated to weakly gneissic quartz diorite to granodiroite.


53°30'
55'00"
GOOSE
BAY
Mud Lake
0
5km
Happy Valley
Goose Bay Base
Churchill
River
13F/8
13F/7
60°30'
53°15'
00
Mag
3
4
6
8
1
1a
2
5
10
10a
River

REGIONAL GEOLOGY - NEWFOUNDLAND

HIGHLIGHTS OF GEOLOGICAL FIELDWORK IN LOWER PALEOZOIC ROCKS OF PISTOLET AND HARE BAYS, NORTHERN PENINSULA

by

Ian Knight
Newfoundland Mapping Section

Geological field mapping of Cambro-Ordovician carbonate and flysch rocks at 1:50,000 scale resumed on unmapped portions of the Eddies Cove (12P/8) and Raleigh (2M/12) map areas. The map area is underlain predominantly by Lower and Middle Ordovician limestones and dolostones that are succeeded by a sequence of Middle Ordovician clastic flysch. Autochthonous strata in the west of the area are gently eastward dipping. In the east the rocks are believed to be parautochthonous. Folding, high angle and thrust faulting, and extensive shearing and recrystallization in zones of high strain characterize the parautochthonous terrane.

Geological highlights of the mapping include:

1. The delineation of a complete stratigraphy in the St. George Group. Four lithologic members occur in the Catoche Formation (see Figure 1).
2. The definition of a widely distributed member of cyclic and fenestral limestone and minor dolostone at the base of the Table Point Formation, Table Head Group. Locally present in the member are brachiopod-crinoid coquina grainstone, parted limestone, and mound beds rich in sponges.
3. The delineation of an unconformity towards the top of the St. George Group, and a younger disconformity within rocks of the basal Table Head Group. An erosion surface that occurs locally at the base of the Table Point Formation may be a third and intermediate disconformity. It may, however, be part of the younger disconformity where erosion reached down to the level of the Aguathuna Formation.

The carbonate platform was probably dissected by northeast trending faults (possibly the early expression of the Ten Mile Lake Fault) prior to erosion and sculpturing of the oldest unconformity surface. This is supported by stratigraphic onlap of Aguathuna Formation dolostones and Table Point Formation limestones onto a prominent lineament that cuts dolomitized Catoche strata. The Catoche strata were locally folded near the lineament, affected by dissolution, silicification and brecciation, and locally eroded prior to onlap. Significant relief upon the surface is supported by the irregular distribution, uneven thickness, and variable lithofacies of the overlying stratigraphic units.

The younger erosion surface which cuts down through basal fenestral limestones of the Table Point Formation, possibly to the Aguathuna Formation, also possesses significant relief. Angular fractures filled by breccia and fine carbonate, and pockets of basal conglomerate,

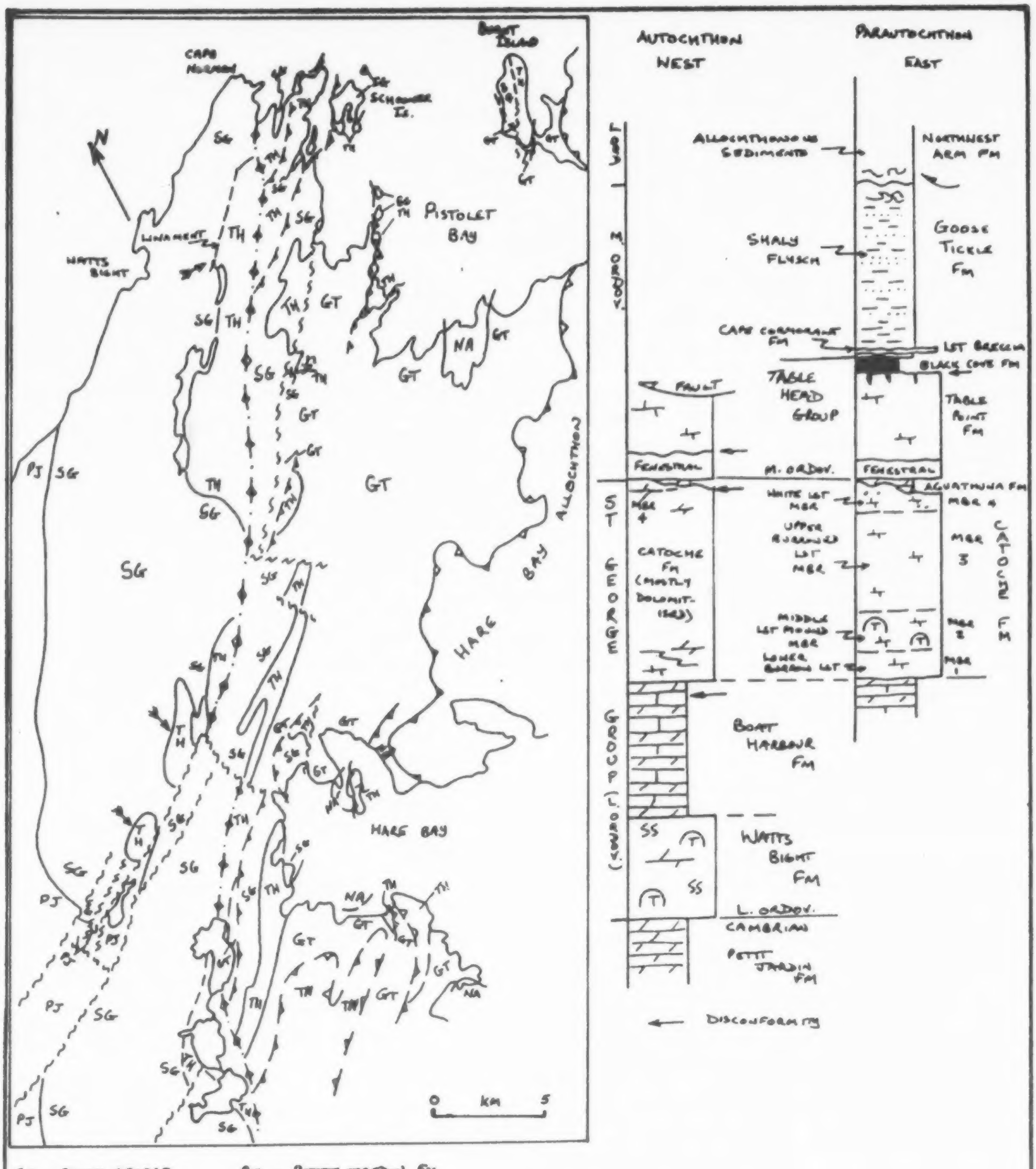

CAPE NORMAN
BURNT ISLAND
SCHOONER IS.
N
PISTOLET BAY
LINAMENT
WATTS BIGHT
SG
TH
GT
NA
PJ
HARE BAY
ALLOCHTHON
HARE BAY
0 KM 5
AUTOCHTHON
WEST
PARAUTOCHTHON
EAST
U. ORD.
M. ORDOV.
ALLOCHTHONOUS SEDIMENTS
NORTHWEST ARM FM
SHALY FLYSCH
GOOSE TICKLE FM
CAPE CORMORANT FM
LST BRECCIA
BLACK COVE FM
FAULT
TABLE HEAD GROUP
TABLE POINT FM
FENESTRAL
M. ORDOV.
FENESTRAL
AGUATHUNA FM
WHITE LST MBR
MBR 4
UPPER BURROWED LST MBR
MBR 3
CATOCHE FM
MBR 4
CATOCHE FM (MOSTLY DOLOMITIZED)
MIDDLE LST MOUND MBR
MBR 2
LOWER BURROW LST
MBR 1
ST GEORGE GROUP (L. ORDOV.)
BOAT HARBOUR FM
SS
WATTS BIGHT FM
SS
L. ORDOV.
CAMBRIAN
PETIT JARDIN FM
DISCONFORMITY
SG – SAINT GEORGE GROUP
TH – TABLE HEAD GROUP
PJ – PETIT JARDIN FM
GT – GOOSE TICKLE FM
NA – NORTHWEST ARM FM
WESTWARD LIMIT OF PAR AUTOCHTHON
THRUST
FAULT
POSSIBLE DISCONFORMITY

FIGURE I: SKETCH MAP AND ORDOVICIAN STRATIGRAPHY OF THE PISTOLET BAY AND HARE BAY AREAS

characterize the younger stratigraphic break.

4. Common sphalerite-galena-pyrite mineralization associated with dolomite breccias and porous epigenetic dolomites is found in basal rocks of the Boat Harbour Formation and dolomitized strata of members 2 and 3 of the Catoche Formation. The importance of a major unconformity in the area suggests that showings in the Boat Harbour Formation may not represent a stratabound target separate from the Catoche showings as previously suggested by Knight (1980). Rather, mineralization at both stratigraphic intervals may have formed during a common event, within suitable stratigraphic traps beneath the unconformity. Sphalerite showings have also been discovered in small lenses where later dolomites replace basal carbonates of the Table Point Formation.

5. No Table Cove Formation occurs in the Table Head Group (see Figure 1). Limestone breccias equivalent to those of the Cape Cormorant Formation (Klappa et al., 1980) are interbedded with shales of the Black Cove Formation, and in basal beds of the overlying Goose Tickle Formation. The breccias were derived by disintegration and erosion of limestones of the Table Point Formation and the overlying Black Cove Shale. The eroded top of the Table Point Formation limestones occurs at several localities in the east of the area, where it is lithified by a siliceous dolomite crust.

6. The gray to green-gray clastic flysch of the Goose Tickle with thin sandstone turbidites. Paleocurrents give a south to southwest paleoflow.

7. The Northwest Arm Formation of green and black, pyritiferous shales and interbedded cherts, limestones, sandstones and green intraformational conglomerates, structurally, and possibly stratigraphically, overlies the Goose Tickle Formation. Most of the Northwest Arm Formation is 'mélange-like'. On the south shore of Pistolet Bay however, the formation appears to have a structurally consistent form. Where strata are relatively competent, they are consistently downward facing even though folded by northeast and northwest trending slightly overturned folds. This suggests that the Northwest Arm Formation may have been emplaced above the Goose Tickle flysch as a major nappe.

8. The autochthonous rocks are gently tilted and cut by a system of northeast trending faults. In eastern parautochthonous strata, a number of thrust faults imbricated the carbonates and the overlying clastic rocks. The terrane was subsequently deformed by northeast trending, westward facing, doubly plunging, asymmetric and recumbent folds. An axial planar slaty cleavage is developed in the clastic rocks. Northeast and northwest trending faults also dissect the terrane.

PALEONTOLOGICAL INVESTIGATION IN WESTERN AND CENTRAL NEWFOUNDLAND, 1985

by

W.D. Boyce and J.S. Ash
Newfoundland Mapping Section

Western Newfoundland

Detailed biostratigraphic sampling for Early Ordovician trilobites and conodonts continued in the Boat Harbour and Catoche Formations (St. George Group). Sampling was done in the following areas:

a) Barbace, Catoche and Laignet Points, Port au Choix Peninsula

b) Eddies Cove West

c) Boat Harbour

d) Cape Norman

The sampling results augment and update the work of Boyce (1983a, b, 1985a) and Fortey (1979).

During the sampling on the tidal island at Laignet Point, a *Phyllograptus* -rich horizon was discovered this may be the same graptolite horizon reported by Kindle (1945). The Laignet Point horizon occurs stratigraphically above the *Phyllograptus* horizon documented by Boyce (1985a, Figure 2).

Reconnaissance biostratigraphic sampling for Early Ordovician trilobites and conodonts commenced in the Boat Harbour and Catoche Formations (St. George Group) in Pistolet Bay. Schooner Island and Burnt Island were sampled. These islands have not been examined in detail since the investigations of Kindle (1945) and Johnson (1949). The upper part of the Catoche Formation consists of fossiliferous limestone on both islands. However, in most other places on the Great Northern Peninsula, this stratigraphic interval consists of diagenetic dolostones which are generally nonfossiliferous except for local silicified cephalopods and/or gastropods.

The senior author is collaborating with Drs. N.P. James and S.H. Williams (Memorial University of Newfoundland - Earth Sciences) on graptolite faunas of the Catoche and Aguathuna Formations (St. George Group). Work is also being done with Mr. J. Botsford and Drs. James and R.K. Stevens (MUN - Earth Sciences) on new trilobite faunas from the Humb^r Arm Allochthon. The results of these studies are to be published elsewhere.

The Codroy area was revisited this year to determine the depositional environment of the Snakes Bight Formation (Anguille Group). Last year complete fossil fish of Early Mississippian (Tournaisian) age were discovered (Boyce, 1985b). Closer examination of the formation this year failed to yield any diagnostic marine fossils such as brachiopods, bryozoa, cephalopods or echinoderms. The conclusion of Knight (1983) and Boyce (1985b) that the formation was possibly of lacustrine origin therefore appears to be valid.

Central Newfoundland

Over thirty significant fossil localities in the Gander and Dunnage Zones were visited with Dr. R. B. Neuman (Smithsonian Institution), and Mr. R. F. Blackwood and Dr. S. P. Colman-Sadd (Newfoundland Department of Mines and Energy). These localities ranged in age from Early Ordovician (Tremadoc) to Early Silurian (Llandovery). Several new localities were discovered during this field-trip.

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THE KING'S POINT VOLCANO-PLUTONIC COMPLEX, NEWFOUNDLAND

by

D.J. Kontak and D.F. Strong
Memorial University of Newfoundland

The King's Point Complex (KPC) of western Newfoundland (Figure 1) was mapped during July and August of 1985. This project was funded by contract between Canewf Resources Ltd. and the Geological Survey of Canada, with additional support from the Natural Sciences and Engineering Research Council of Canada Operating Grant No. A7975. The complex forms part of an extensive suite of post-orogenic, intrusive and volcanic, metaluminous to peralkaline magmatism. The King's Point Complex evolved as a volcano-plutonic structure, now represented by a central granite to syenite intrusion, enveloped by intrusive and extrusive rhyolite porphyries; these rock types are all cut by abundant mafic dikes. The presence of an arcuate ring dike, vent structures, and a variety of pyroclastic deposits suggest a cauldron subsidence origin for the King's Point Complex. Petrological data and field relationships, e.g., mafic clots in the granite to syenite units, indicate that magma mixing processes were important in the petrogenesis of this suite. This involved both felsic and mafic liquids, represented in the complex by the rhyolite porphyries and mafic dikes respectively. Extensive, post-magmatic fluid/rock interaction modified the primary mineralogy and chemistry of the igneous rocks to a peralkaline assemblage. This is reflected by the presence of megascopically conspicuous riebeckite oikocrysts in the rhyolite porphyry units and also by enrichment in trace elements such as Zr, Nb, Zn and Y.

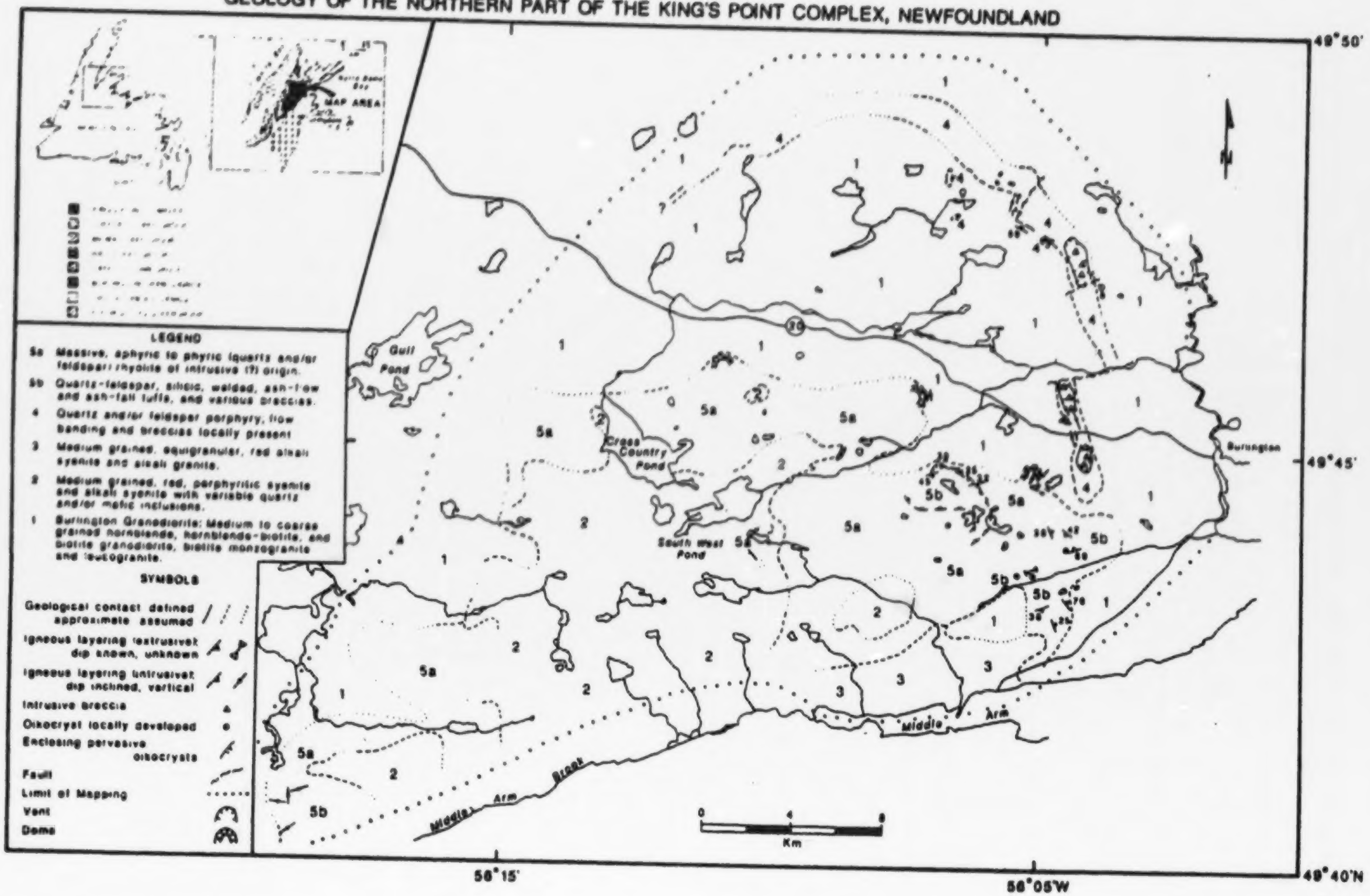

GEOLOGY OF THE NORTHERN PART OF THE KING'S POINT COMPLEX, NEWFOUNDLAND
49°50'
49°45'
49°40'N
56°15'
56°05'W
MAP AREA
LEGEND
5a Massive, aphyric to phyric (quartz and/or feldspar) rhyolite of intrusive (?) origin.
5b Quartz-feldspar, silicic, welded, ash-flow and ash-fall tuffs, and various breccias.
4 Quartz and/or feldspar porphyry, flow banding and breccias locally present
3 Medium grained, equigranular, red alkali syenite and alkali granite.
2 Medium grained, red, porphyritic syenite and alkali syenite with variable quartz and/or mafic inclusions.
1 Burlington Granodiorite: Medium to coarse grained hornblende, hornblende-biotite, and biotite granodiorite, biotite monzogranite and leucogranite.
SYMBOLS
Geological contact defined approximate assumed
Igneous layering (extrusive) dip known, unknown
Igneous layering (intrusive) dip inclined, vertical
Intrusive breccia
Oikocryst locally developed
Enclosing pervasive oikocrysts
Fault
Limit of Mapping
Vent
Dome
Gull Pond
Cross Country Pond
South West Pond
Burlington
Middle Arm
Middle Arm Brook
0
4
8
Km

Figure 1: *Geology of the northern part of the King's Point Complex, Newfoundland.*

GEOLOGY OF THE HARBOUR BRETON COMPLEX, NEWFOUNDLAND

by

D. J. Furey and D. F. Strong
Department of Earth Sciences
Memorial University of Newfoundland

The Devonian Harbour Breton Complex was mapped during the summer of 1985 as part of a contract, "Post-Orogenic Magmatism of Newfoundland", between Canewf Resources Ltd. and the Geological Survey of Canada (Precambrian Division). The complex comprises two granitoid plutons that intrude late Precambrian to Devonian volcanic and sedimentary rocks in the Avalon Zone of southern Newfoundland (Figure 1). Both plutons are elongate in a northeasterly direction; the Main Stock is about 30 km long and 6 km wide and the Old Woman Stock is aout 12 km long by 6 km wide. Both are zoned from an outer contact zone of miarolitic biotite/hornblende-bearing micrograrite, passing inward through alkali feldspar granite, medium grained biotite-hornblende granite, and plagioclase-phyric monzogranite, to a core of K-feldspar-phyric granite and microgranite. A number of Mo-Cu-F showings occur along the eastern margins of the Old Woman Stocks.

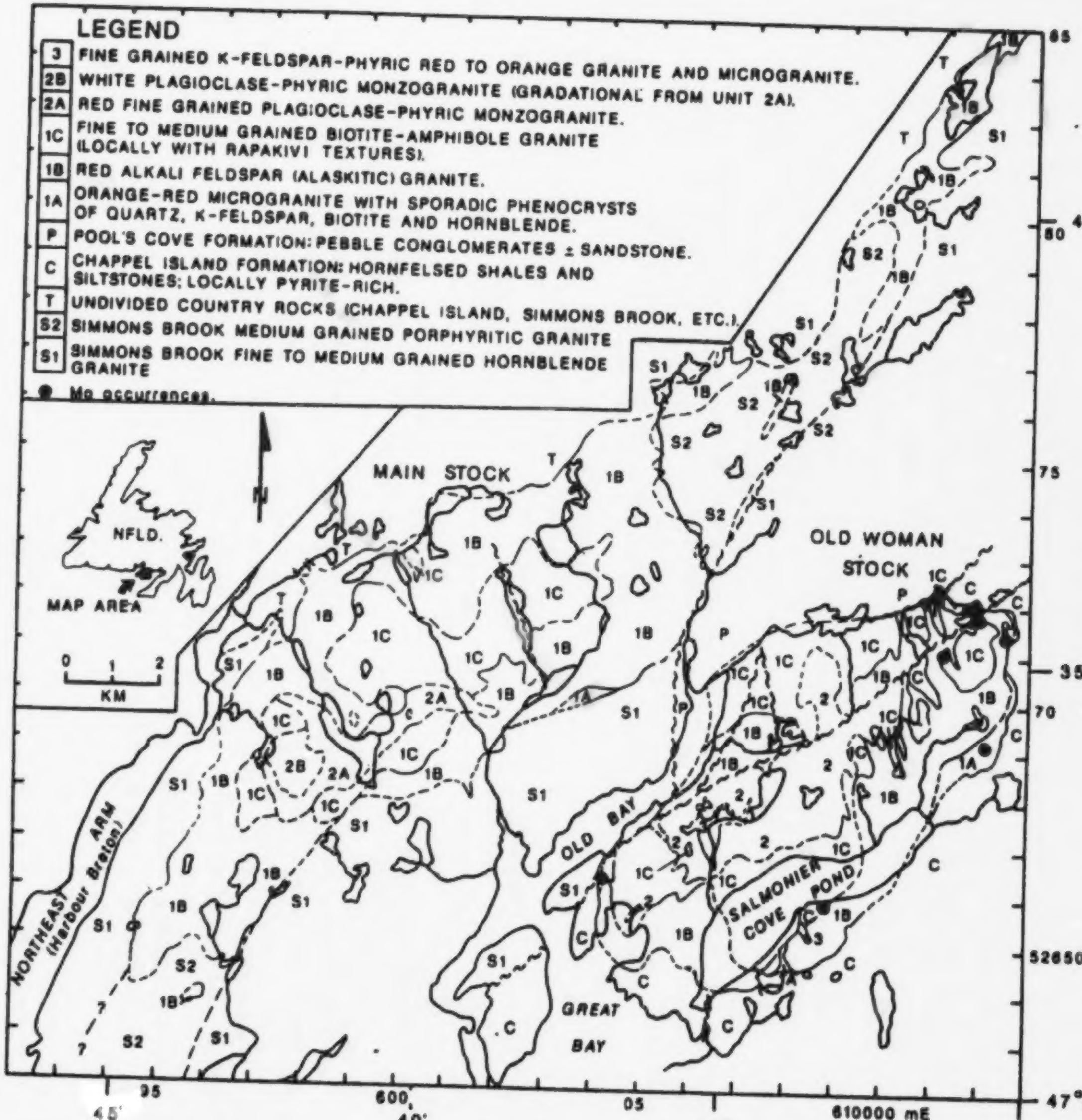

LEGEND
3 FINE GRAINED K-FELDSPAR-PHYRIC RED TO ORANGE GRANITE AND MICROGRANITE.
2B WHITE PLAGIOCLASE-PHYRIC MONZOGRANITE (GRADATIONAL FROM UNIT 2A).
2A RED FINE GRAINED PLAGIOCLASE-PHYRIC MONZOGRANITE.
1C FINE TO MEDIUM GRAINED BIOTITE-AMPHIBOLE GRANITE (LOCALLY WITH RAPAKIVI TEXTURES).
1B RED ALKALI FELDSPAR (ALASKITIC) GRANITE.
1A ORANGE-RED MICROGRANITE WITH SPORADIC PHENOCRYSTS OF QUARTZ, K-FELDSPAR, BIOTITE AND HORNBLENDE.
P POOL'S COVE FORMATION: PEBBLE CONGLOMERATES ± SANDSTONE.
C CHAPPEL ISLAND FORMATION: HORNFELSED SHALES AND SILTSTONES; LOCALLY PYRITE-RICH.
T UNDIVIDED COUNTRY ROCKS (CHAPPEL ISLAND, SIMMONS BROOK, ETC.)
S2 SIMMONS BROOK MEDIUM GRAINED PORPHYRITIC GRANITE
S1 SIMMONS BROOK FINE TO MEDIUM GRAINED HORNBLENDE GRANITE
● Mo occurrences.
NFLD.
MAP AREA
N
0 1 2
KM
MAIN STOCK
OLD WOMAN STOCK
OLD BAY
SALMONIER COVE POND
GREAT BAY
NORTHEAST ARM (Harbour Breton)
85
80
75
70
40'
35'
5265000 mN
47°30'
95
600
05
610000 mE
45'
40'
35'
55°30'

Figure 1: *The Harbour Breton Complex and surrounding rocks, southern Newfoundland.*

GEOLOGICAL INVESTIGATIONS OF THE SPRINGDALE GROUP, CENTRAL NEWFOUNDLAND

by

Marylou Coyle and D.F. Strong
Department of Earth Sciences
Memorial University of Newfoundland

The Springdale Group volcanic and sedimentary sequence has been mapped at a regional scale of 1:25,000, with more detailed mapping in local areas, in the Springdale (12H/8), Sheffield Lake (12H/7), Great Gull Pond (12H/1) and The Topsails (12H/2) map areas. The results of mapping in 1984, funded by the Geological Survey of Canada, demonstrated the existence of a large caldera-fill sequence which occupies most of the Springdale map area. It is composed of large volumes of high-silica, ash-flow, crystal, vitric and/or lithic tuffs, intercalated with basaltic and andesitic flows and pyroclastics, and fluviatile red sandstones and conglomerates (Coyle et al., Geological Survey of Canada Current Research, Part A 1985, p. 157-163). This structure and associated units extend to the south and west, as determined by detailed mapping in these regions during the summer of 1985 (under contract between Canewf Resources Ltd. and the Geological Survey of Canada).

The Springdale caldera is associated with other caldera-related rocks of Siluro-Devonian age being studied in detail throughout this region. The Sheffield Lake area (Figure 1) consists, in part, of high level peralkaline porphyries and commenditic veneer rocks. They have distinctive geochemistry, as characterized by metasomatically produced sodic amphibole oikocrysts. These features provide a geochemical and volcanological link between the Springdale caldera and the King's Point Complex to the northwest.

The margins of the Springdale Group are currently being mapped to delineate the caldera boundaries and to understand the regional context for these assemblages. The northwestern boundary area of the Springdale Group is depicted in Figure 2. As in other marginal areas of the caldera where units become thin and overlap, the geology is complex. The Lobster Cove and other faults in this area further modify the original depositional and intrusive relationships, as do the intrusion (and associated contact metamorphism) of granitoid rocks of the Topsails Complex to the south.

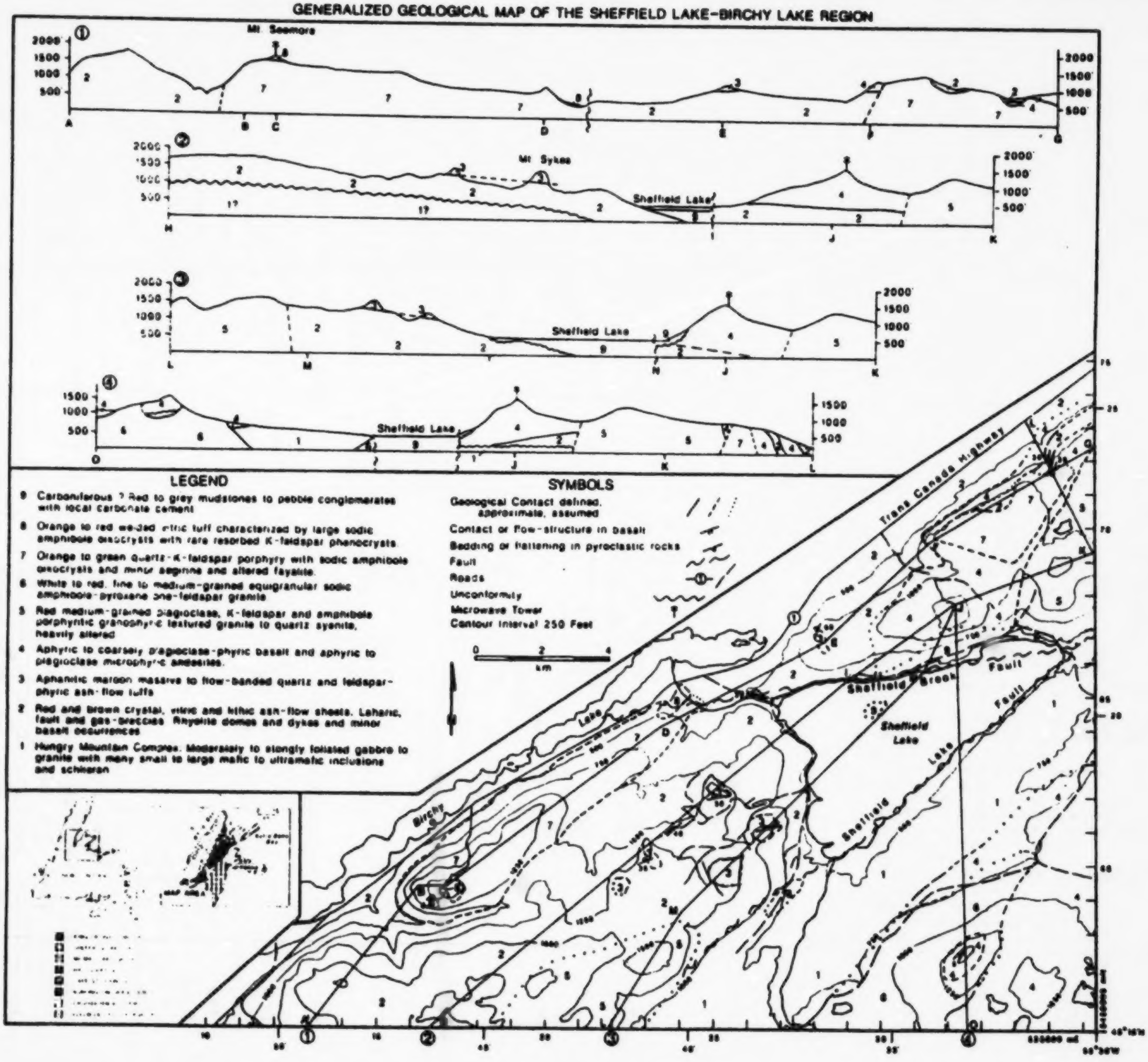

GENERALIZED GEOLOGICAL MAP OF THE SHEFFIELD LAKE-BIRCHY LAKE REGION
Mt. Seemore
Mt. Sykes
Sheffield Lake
Sheffield Brook
Birchy Lake
Trans Canada Highway
Fault
LEGEND
9 Carboniferous ? Red to grey mudstones to pebble conglomerates with local carbonate cement
8 Orange to red welded vitric tuff characterized by large sodic amphibole oikocrysts with rare resorbed K-feldspar phenocrysts.
7 Orange to green quartz-K-feldspar porphyry with sodic amphibole oikocrysts and minor aegirine and altered fayalite.
6 White to red, fine to medium-grained equigranular sodic amphibole-pyroxene one-feldspar granite
5 Red medium-grained plagioclase, K-feldspar and amphibole porphyritic granophyric textured granite to quartz syenite, heavily altered
4 Aphyric to coarsely plagioclase-phyric basalt and aphyric to plagioclase microphyric andesites.
3 Aphanitic maroon massive to flow-banded quartz and feldspar-phyric ash-flow tuffs
2 Red and brown crystal, vitric and lithic ash-flow sheets. Laharic, fault and gas-breccias. Rhyolite domes and dykes and minor basalt occurrences
1 Hungry Mountain Complex. Moderately to strongly foliated gabbro to granite with many small to large mafic to ultramafic inclusions and schlieren
SYMBOLS
Geological Contact defined, approximate, assumed
Contact or flow-structure in basalt
Bedding or flattening in pyroclastic rocks
Fault
Roads
Unconformity
Microwave Tower
Contour interval 250 Feet
0 2 4
km

Figure 1: *Generalized geological map of the Sheffield Lake-Birchy Lake region.*

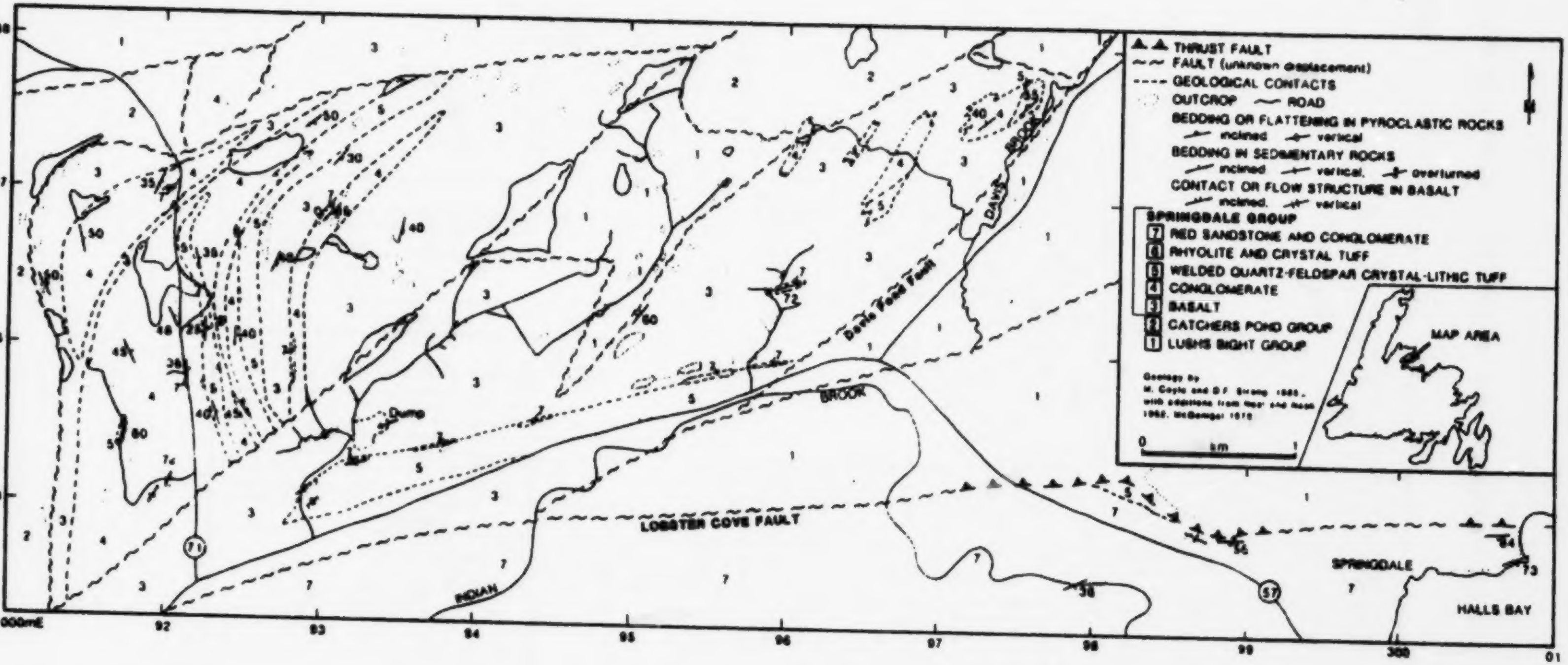

THRUST FAULT
FAULT (unknown displacement)
GEOLOGICAL CONTACTS
OUTCROP
ROAD
BEDDING OR FLATTENING IN PYROCLASTIC ROCKS
inclined
vertical
BEDDING IN SEDIMENTARY ROCKS
inclined
vertical,
overturned
CONTACT OR FLOW STRUCTURE IN BASALT
inclined,
vertical
SPRINGDALE GROUP
7 RED SANDSTONE AND CONGLOMERATE
6 RHYOLITE AND CRYSTAL TUFF
5 WELDED QUARTZ-FELDSPAR CRYSTAL-LITHIC TUFF
4 CONGLOMERATE
3 BASALT
2 CATCHERS POND GROUP
1 LUSHS BIGHT GROUP
Geology by
M. Coyle and D.F. Strong 1985,
0
km
1
MAP AREA
N
Davis Pond Fault
DAVIS BROOK
LOBSTER COVE FAULT
INDIAN
Dump
SPRINGDALE
HALLS BAY
71
57
5485000mN
291000mE
92
93
94
95
96
97
98
99
300
01
86
87
88

Figure 2: *General geology of the northwestern margin of the Springdale Group.*

GEOLOGY OF SNOWSHOE POND (12A/7) AREA, NEWFOUNDLAND

by

Stephen Colman-Sadd
Newfoundland Mapping Section

The eastern third of the Snowshoe Pond area was mapped at a scale of 1:50,000 during 1985.

The area is geologically divisible into two main parts, separated by Noel Pauls Line (Brown and Colman-Sadd, 1976) which trends west-southwest, southeast of Lake Douglas:

1. Clastic metasediments, provisionally equated with the Lower to Middle Ordovician Spruce Brook Formation (Colman-Sadd and Swinden, 1984), occur in the southeast. They are intruded by several ages of granite and granodiorite.
2. Volcanic rocks and associated sediments of probable mid-Ordovician age, and the Rogerson Lake Conglomerate, which may be Silurian, occur in the northwest, and are typical of the Newfoundland Central Volcanic Belt (Kean et al., 1981).

The clastic metasediments of Unit 1 consist of interbedded quartzite, psammite and semipelite, and are almost everywhere metamorphosed to sillimanite grade or partially melted. They have been intruded pretectonically by mafic dikes and granite of Unit 6, and posttectonically by granodiorite of Unit 8 and pegmatite of Unit 9.

The granite of Unit 6 has a pervasive tectonic fabric, which is locally mylonitic. The fabric is folded into a tight antiform with a wavelength of 5 to 8 km and a gentle northeasterly plunge. The antiform is a prominent feature on air photographs.

Unit 7 migmatite, which appears to be derived, at least in part, by melting or intrusion of the clastic metasediments of Unit 1, is gradational with granodiorite of Unit 8. Unit 8 is a part of the North Bay Granite and is for the most part undeformed. Pegmatite of Unit 9 is posttectonic and probably related to the North Bay Granite.

Noel Pauls Line, which marks the southeastern edge of the Central Volcanic belt, is represented by the contact between the foliated granite of Unit 6 and the intensely deformed volcanic and sedimentary rocks of Unit 2. The intensity of deformation in the two units adjacent to the line suggests a tectonic contact, and no clear evidence has been found to indicate whether or not the contact was originally intrusive.

The rocks of Unit 2 consist of fine grained quartzo-felspathic layers (probably felsic tuff) and pyritic schist. They have an intense composite fabric which has been tightly folded by northeast plunging folds. They grade northwestward into, or are faulted against, less deformed felsic crystal tuff (Unit 3) that has interbeds of conglomerate and phyllite. To the northwest of Lake Douglas, siltstone and shale interlayered with mafic tuff (Unit 4) is in presumed fault contact with purple Rogerson Lake Conglomerate (Unit 5). All the rocks northwest of Noel Pauls Line are metamorphosed in the greenschist or lower amphibolite facies.

LEGEND

SILURO-DEVONIAN

10 White leucogranite

9 Garnet-tourmaline-muscovite pegmatite

8 Porphyritic or equigranular, gray or pink, biotite granodiorite of the North Bay Granite; locally contains muscovite and locally has a fabric

7 Migmatite, rich in biotite schlieren and metasedimentary fragments

6 Equigranular, foliated, gray or pink, biotite granite, locally mylonitic

SILURIAN?

5 Rogerson Lake Conglomerate: purple, clast supported, polymictic conglomerate and sandstone

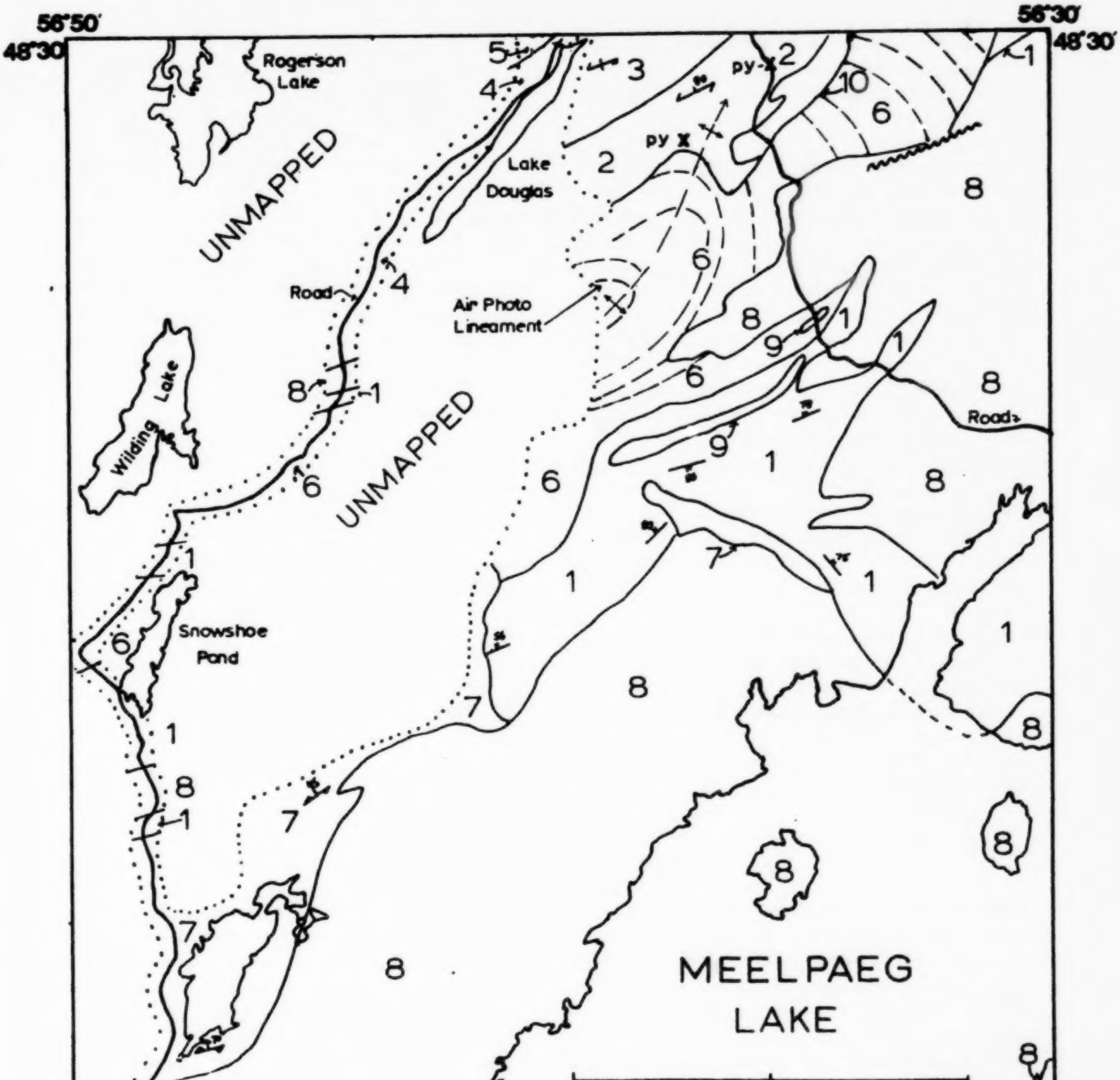
ORDOVICIAN

4 Thinly bedded, brown, gray or green siltstone and shale with minor mafic volcanic rocks

3 Gray, felsic crystal tuff, with interbedded phyllite and conglomerate containing mostly felsic volcanic clasts

2 Polydeformed, fine grained, grav, felsic volcanic rocks and pyritic schist

1 Gray quartzite, psammite and schist; probably equivalent to Spruce Brook Formation



56°50′
48°30′
56°30′
48°30′
Rogerson Lake
UNMAPPED
Lake Douglas
py
py x
Road
Air Photo Lineament
Wilding Lake
UNMAPPED
Snowshoe Pond
Road
MEELPAEG LAKE
0
5
10 Km
48°15′
56°50′
48°15′
56°30′
1
2
3
4
5
6
7
8
9
10

Figure 1: *General geology of the eastern part of the Snowshoe Pond (12A/7) map area.*

The principal mineral exploration targets are:

1) Precious and base metals in the felsic volcanic rocks of Units 2 and 3. These rocks are commonly pyritiferous and chalcopyrite is reported along strike to the northeast (Kean and Jayasinghe, 1980).

2) Tungsten mineralization in granitic rocks of Units 6 to 10. Although no occurrences have been found in the Snowshoe Pond area, wolframite, scheelite, molybdenite and pyrite are present in quartz veins or as disseminations on joint surfaces in granitoid rocks in the Wolf Mountain area, less than 5 km to the south (Dickson, 1982).

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GEOLOGY OF THE ST. JOHN'S AREA

by

Arthur F. King
Department of Earth Sciences
Memorial University of Newfoundland

Mapping of the bedrock geology and surficial deposits of some 500 square kilometres in and around the City of St. John's is expected to be completed by November 1985. The field survey, carried out at a scale of 1:12,500, represents the first systematic detailed regional mapping and division of the late Precambrian Harbour Main, Conception, St. John's, and Signal Hill Groups in the area since they were subdivided in southern Avalon Peninsula by Williams and King (1979). An account of the regional geological setting and previous geological work is given in King (1984). Knowledge of the distribution, origin and tectonic development of the late Precambrian lithofacies will also provide a better understanding of the geochemical and hydrogeological features of this region.

The St. John's Peninsula east of the Topsail Fault (Figure 1) is divisible into six main tectonostratigraphic zones, each with its own distinctive rock types and structural style. Zone 1 (Map Unit B) is bounded by an eastern splay of the Topsail Fault and consists of highly deformed meta-tuffs, and felsic and mafic volcanic rocks (Harbour Main Group), and siliceous volcaniclastic rocks (Conception Group). Associated granitoid rocks (Holyrood Plutonic Suite?) are boudinaged but younger plugs and dikes of gabbro and felsite, which occur along a fault marking the eastern boundary of the zone, are for the most part undeformed.

Zone 2 occurs near Portugal Cove and consists of fault-bounded blocks of massive and pillow basalt (Map Unit A). Red argillite beds in the massive basalt show open to tight folds; stratigraphic top determinations in the argillite and pillows indicate much of the eastern margin of this zone, which is steeply dipping to the west, is overturned.

Both Zones 1 and 2 are in fault contact with Zone 3 which in ascending order consists of chert (Unit 1); interbedded, streaky, silty sandstone (Unit 2) and diamictite (Unit 2a), interpreted as a series of submarine debris flows with a possible glacio-marine component; thick-bedded Drook Formation turbiditic sandstones (Unit 3); average-bedded turbiditic sandstone, siliceous siltstone and tuff (Unit 4), representing the lower half of the Mistaken Point Formation. These relatively competent rocks form large scale domes and basins which correspond with areas of topographic high and low relief. Windsor Lake for example, is within a complex structural basin.

Zone 4 is conformably above Zone 3 and is easily recognized by conspicious red and green tuffaceous siltstones and sandstones (Unit 5A) which are correlatives of the Hibbs Hole Member, now regarded as the upper half of the Mistaken Point Formation; thin-bedded, turbiditic, argillaceous sandstone (Unit 5B) of the Trepassey Formation defines the top of the zone. Both of these argil-

LEGEND

SIGNAL HILL GROUP (Units 8-11)

11 Blackhead Formation (red sandstone)
  11A Maddox Cove Member (red mudstone and sandstone)

10 Cuckold Formation (red conglomerate)

9 Quidi Vidi Formation (red sandstone)

8 Gibbett Hill Formation (green sandstone)

ST. JOHN'S GROUP (Units 5B-7)

7 Renews Head Formation (black shale and sandstone)

6 Fermeuse Formation (black shale with 'slump' beds)

5B Trepassey Formation (thin-bedded, argillaceous sandstone)

CONCEPTION GROUP (Units 1-5A; in part Unit B)

5A upper Mistaken Point Formation (Hibbs Hole Member: red and green tuffaceous siltstone and sandstone)

4 lower Mistaken Point Formation (turbiditic sandstone and tuff)

3 Drook Formation (thick bedded, turbiditic sandstone)

2 "Torbay Formation" (coarse grained, streaky, laminated sandstone)
  2a "Bauline Line member" (diamictite)

1 "Broad Cove River Formation" (thick-bedded chert and sandstone)

HARBOUR MAIN GROUP (Unit A; in part Unit B)

A "Portugal Cove Formation" (massive and pillow basalt)

B "St. Phillips Formation" (meta-tuff, sandstone, basalt, rhyolite)

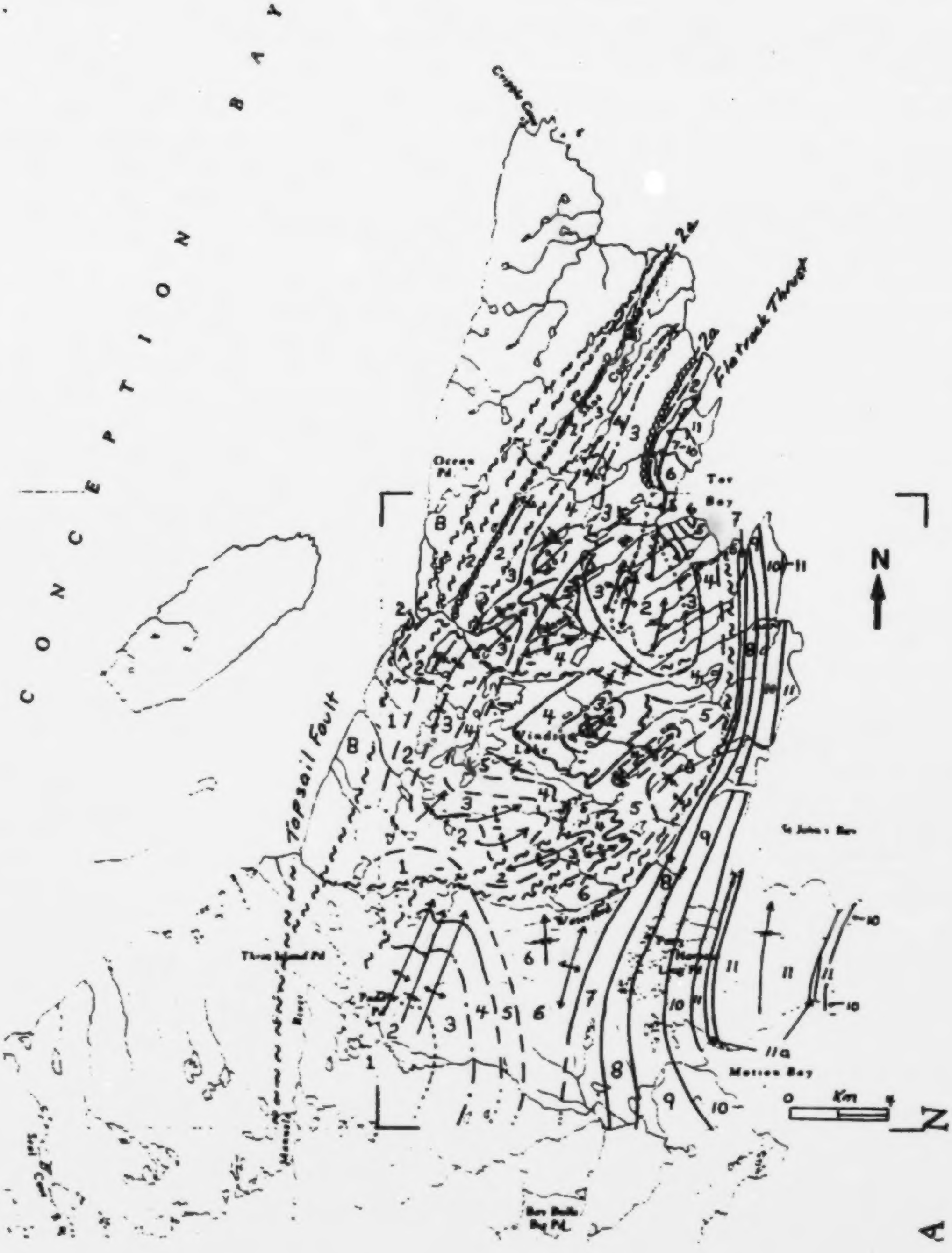
CONCEPTION BAY
Topsail Fault
Flatrock Thrust
2a
2a
Ocean Pd
Tor Bay
N
Windsor Lake
St. John's Bay
Three Island Pd
Motion Bay
Bay Bulls Big Pd.
11a
0 Km 4
N
A

Figure 1: *General geology of the St. John's Peninsula.*

laceous units are highly susceptible to frost action and are therefore only exposed in the low ground between intervening domes where they display an intricate pattern of interference folds.

Zone 5 is a coarsening upwards sequence stratigraphically above and to the east of Zone 4, and consists of tightly folded Fermeuse Formation black shale (Unit 6) and Renews Head Formation sandy shale (Unit 7). Locally, Zone 5 pinches out tectonically, where compressed between competent units and where overthrust by competent units, as in the Flat Rock thrust zone.

Competent Signal Hill Group units of green sandstone (Unit 8), red sandstone (Unit 9), red conglomerate (Unit 10) and red sandstone (Unit 11) form Zone 6. It is the least deformed of all the zones and throughout eastern Avalon Peninsula displays broad large-scale open folds such as the Blackhead Syncline.

In total, 1500 point descriptions of bedrock and surficial deposits have been completed. There is a close correlation between bedrock lithology and dominant clast type in till indicating that the till veneer is of local origin, commonly less than two kilometres from the source.

Plans include completion of mapping, petrological and geological analyses, preparation of 1:12,500 maps for open file release, and a final report with 1:25,000 map for publication.

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SUMMARY OF FIELD WORK IN THE SILVER MOUNTAIN AREA (12H/11), WESTERN NEWFOUNDLAND

by

J.V. Owen
Precambrian Geology Division
Geological Survey of Canada

The Silver Mountain area is situated some 50 km north-northeast of Deer Lake, Newfoundland, and coincides with the southern portion of the northern Long Range Mountains of the Great Northern Peninsula. The Long Range Mountains are predominantly underlain by Precambrian rocks, which are flanked to the east and west by miogeoclinal rocks of the Appalachian Orogen.

The geology of the Silver Mountain area is dominated by crystalline Precambrian rocks which record a prolonged history of metamorphism, deformation and intrusion. The oldest rocks are granulite-facies, quartzofeldspathic gneisses of inferred igneous parentage. These include: quartz-dioritic to granitic variants (units 1, 2 and 3), and spatially associated anatectic(?) biotite granite (unit 5). Biotite ± garnet ± sillimanite ± spinel ± graphite- bearing migmatitic gneiss (unit 7), of uncertain age relative to the orthogneiss, is associated with quartzite (unit 8) and metacarbonate (unit 7) bands, and is inferred to be paragneiss. Unit 4, which includes a variety of amphibolites and dioritic gneisses, probably encompasses several ages of mafic rocks, which may predate or postdate the high-grade metamorphism recorded in the quartzofeldspathic gneiss.

The gneissic rocks are intruded by a large pluton of mafic rocks, including mesocratic to leucocratic, pyroxene ± olivine ± amphibole -bearing metagabbro (unit 9) and pegmatitic metagabbro (unit 10), and by satellite bodies of amphibole -bearing subophitic metagabbro (unit 11). A variety of massive to foliated granites and granodiorites (units 12 to 15) also intrude the gneisses. Quartz-rich mica schist with quartzite interbands (unit 16), banded marble (unit 17), massive to foliated felsic porphyry (unit 19), and mafic schist (unit 18), which occur in the eastern portion of the map area, are considered to be lower Paleozoic (Cambro-Ordovician?).The schistose rocks have been thrust westward over the Precambrian gneisses and intrusive rocks, and are partly overlain by undeformed Carboniferous conglomerates and red beds (unit 20) of the Deer Lake Basin.

LEGEND

CARBONIFEROUS

20 Polymict conglomerate, red sandstone.

CAMBRO-ORDOVICIAN (?)

19 Felsic Prophyry.

18 Metadiorite; mafic schist.

17 Marble.

16 Metasedimentary schist; quartzite.

NEOHELIKIAN (?) OR OLDER

15 Biotite granite-granodiorite.

14 Ksp-megacrystic biotite granite.

13 Ksp-megacrystic biotite ± hornblende granodiorite-granite.

12 Biotite + hornblende granodiorite.

11 Subophitic metagabbro.

10 Pegmatitic metagabbro.

9 Pyroxene ± olivine ± amphibole-bearing metagabbro.

PALEOHELIKIAN (?) OR OLDER

8 Massive quartz; quartzite.

7 Bi ± gt ± sil ± gp quartzofeldspathic gneiss.

6 Marble; calcsilicate rock.

5 Biotite granite.

4 Amphibolite; dioritic gneiss.

3 Bi ± hbl ± opx granitic-granodioritic gneiss.

2 Bi ± hbl ± opx quartz dioritic-granodioritic gneiss.

1 Bi ± hbl ± opx quartz dioritic-tonalitic gneiss.

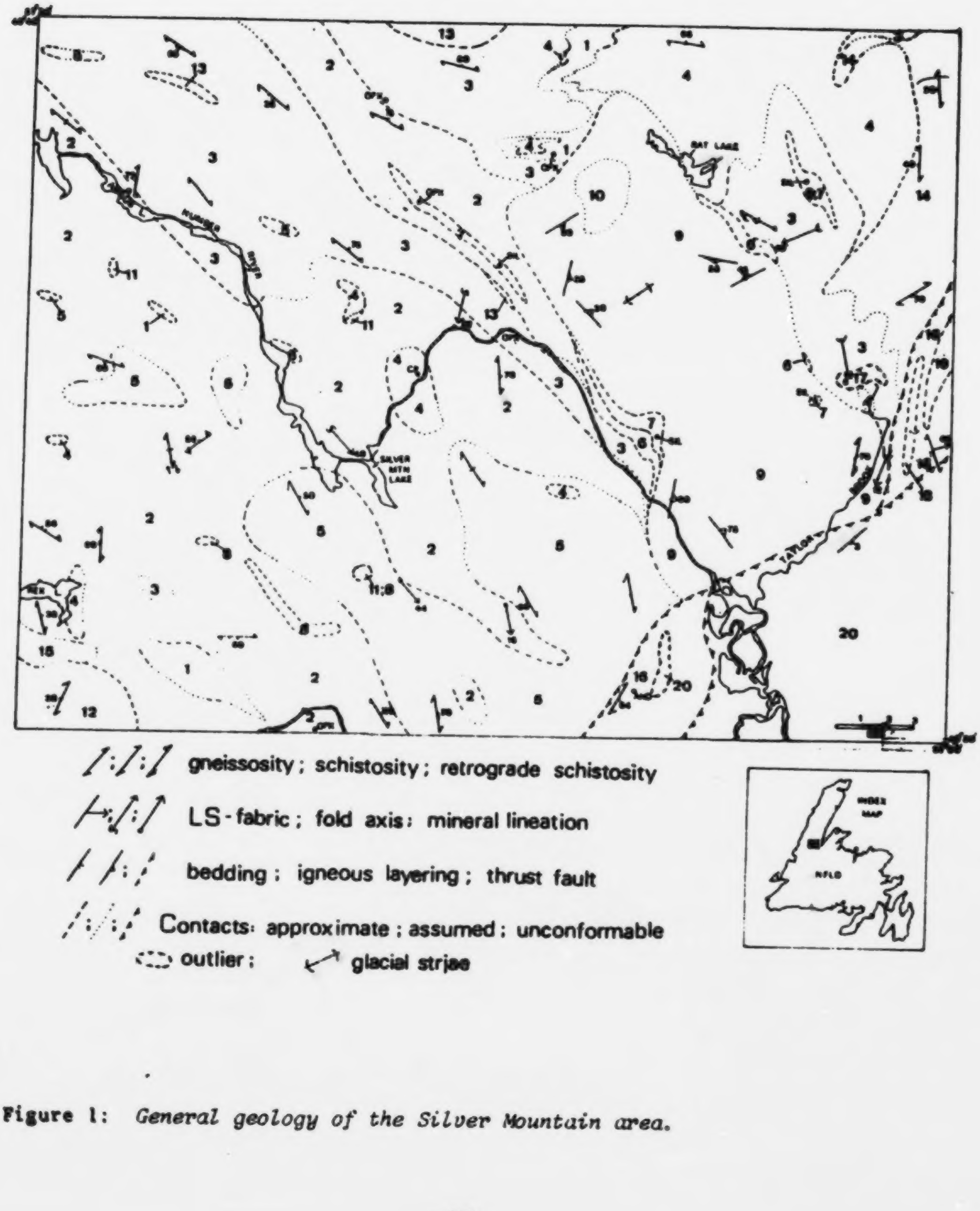
gneissosity; schistosity; retrograde schistosity
LS-fabric; fold axis: mineral lineation
bedding; igneous layering; thrust fault
Contacts: approximate; assumed; unconformable
outlier;
glacial striae
SILVER MTN LAKE
RAT LAKE
TAYLOR
INDEX MAP
NFLD

Figure 1: *General geology of the Silver Mountain area.*

GEOCHEMISTRY/GEOPHYSICS

REGIONAL GEOCHEMICAL ATLAS OF NEWFOUNDLAND

by

P.H. Davenport
Geochemistry and Geophysics Section

The collection of lake sediment samples for the regional geochemical survey of Newfoundland was completed in 1981, and in June 1982, the last of the data was released on open file. The sampling covers all of the island of Newfoundland except for the Terra Nova and Gros Morne National Park areas, and the collection phase extended over an eight year period from 1973 to 1981. Initially surveys were restricted to specific geological terranes, but since 1976 the surveys were planned with the goal of complete coverage of the island. The data, therefore, are available as some 20 open files.

Despite the patchwork coverage, the sampling method throughout was consistent, with organic lake sediment samples being the sample medium. Furthermore, the older samples were re-analysed in the Mineral Development Division laboratory so that all samples have been analysed for Cu, Pb, Zn, Co, Ni, Ag, F, Mo, U, Mn, Fe and LOI to National Geochemical Reconnaissance standards. Analytical consistency has been further checked by re-analysing a randomly selected 5% subset from each of the individual surveys as a single analytical batch. No significant trends were noted in absolute levels throughout the multi-year data, and analytical reproducibility is good.

Over the past year the regional geochemical data have been reorganized by 1:250,000 NTS sheet. Currently the rock type underlying each sample site is being added to the files, using the Preliminary Geological Map of Newfoundland (Hibbard, 1983) as an island-wide geological framework. This should be complete by year end, and the data in digital form available.

The major source of variation in element concentration levels in effectively designed regional geochemical surveys is the contrast in bedrock geochemistry due to gross lithological changes. To identify subtle geochemical variations due to mineralization in regional data, it is commonly necessary to take into account these major contrasts, and it is anticipated that the inclusion of up-to-date and consistent geological data on the computer files of the geochemical data will allow this to be done, thus adding to the usefulness of the regional geochemical files in mineral exploration.

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EXPLORATION GEOCHEMICAL STUDIES OF LABRADOR GRANITOIDS

by

John McConnell
Geochemistry and Geophysics Section

Introduction

Field work during 1985 involved the collection of a variety of sample materials for geochemical analyses from granitoid terranes in Labrador. Work was done in five areas (see Figure 1) which are considered to have high potential for hosting granite-related mineralization, such as Sn, W, REE, Nb, Be and Zr. Sample media include rock, soil, stream sediment/water, and lake sediment/water. The quantity and type of samples collected in each area are summarized in Table 1. Surficial samples will be analyzed for some, or all, of the following elements and variables: Ag, Ba, Be, Ce, Co, Cu, F, Fe, La, Li, Mo, Mn, Nb, Ni, Pb, Rb, Sn, Sr, Ta, Th, U, W, Y, Zn, Zr, loss-on-ignition and pH. Rocks will also be analyzed for major and minor elements.

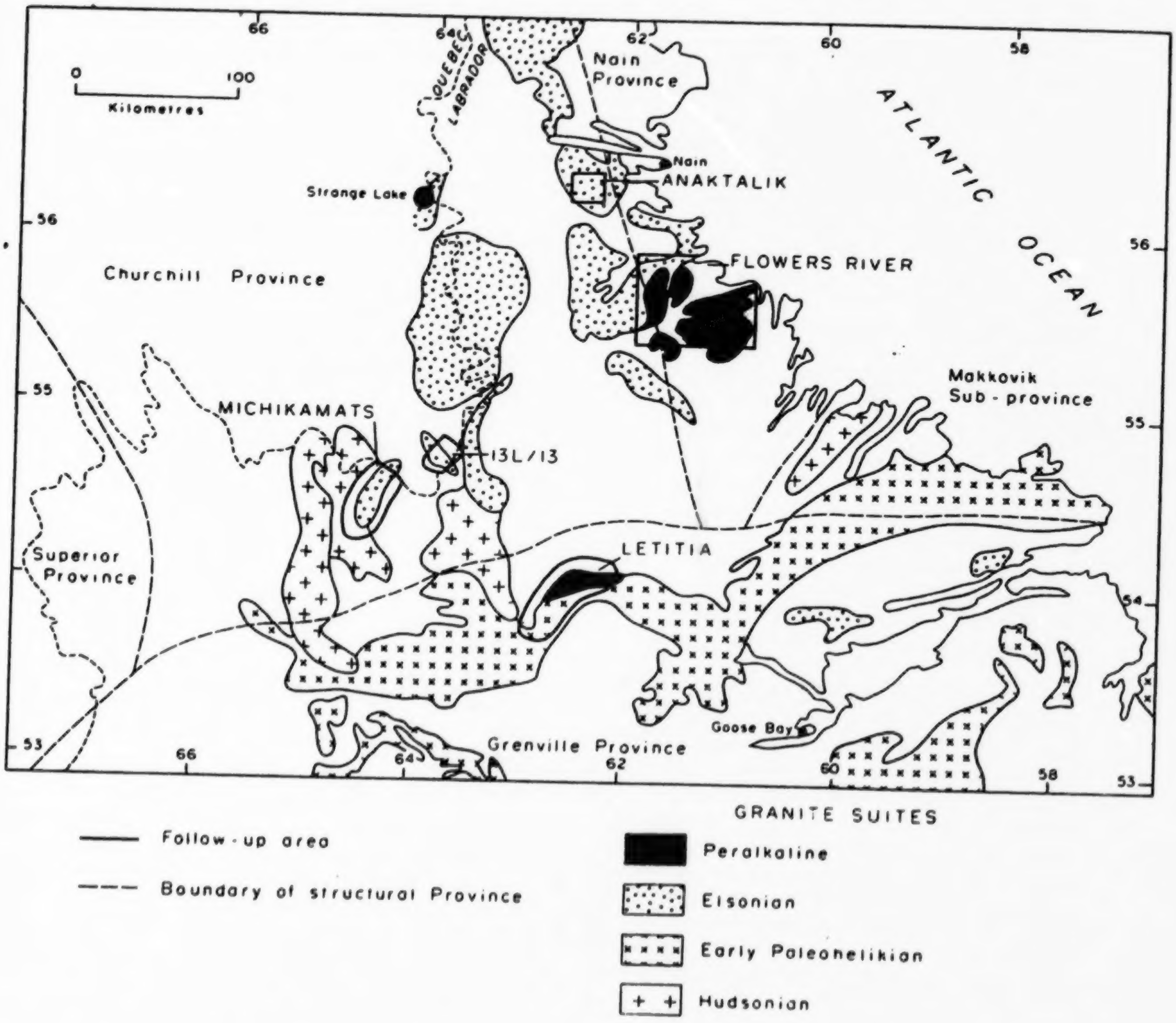
Area Descriptions

Letitia Lake Anomaly. The area is underlain by peralkaline gneisses and volcanic rocks. Previously known mineralization includes occurrences of Be, Nb, Th, Zr and REE. Results of a recent reconnaissance lake sediment and water survey from this area indicated high concentrations of Pb, F and Zn (Geological Survey of Canada, 1983). Analyses of F and Zn in samples of lake water collected this summer during a detailed lake survey revealed three highly anomalous areas within the broader regional anomaly. Two of these contain previously known mineralized outcrops and boulders. Soil samples (B horizon) were collected from a 9 x 11 km grid in the third area, in the course of which several boulders of radioactive gneiss were found.

Flowers River Area. The Flowers River Igneous Suite, consisting of felsic volcanic rocks intruded by peralkaline granite, is one of three known peralkaline complexes in Labrador. As such, it represents a possible host for various types of mineral deposits. Previous geological mapping (Hill, 1982) and geochemical studies (McConnell, 1984) located occurrences of Be, F, Zr, Nb, Y, Pb, and Zn. A systematic, high density (1 sample per 4 km^2) rock and soil sampling survey of the intrusive phases was made this summer, based on Hill's 1:100,000 mapping. Geochemical and lithological studies of these samples will be made, in an effort to recognize areas of geochemical zoning

Table 1: *Location, type and quantity of samples collected during 1985.*

Area	Rock	Lake Sediment and Water	Stream Sediment and Water	Soil
Letitia	4	203		209
Flowers River	347			239
Michikamats	10	123		
13L/13	7	23	14	
Anaktalik	5	67	3	



0 100
Kilometres
66
64
62
60
58
56
55
54
53
QUEBEC
LABRADOR
Nain Province
Nain
ANAKTALIK
ATLANTIC OCEAN
Strange Lake
Churchill Province
FLOWERS RIVER
Makkovik Sub-province
MICHIKAMATS
13L/13
Superior Province
LETITIA
Goose Bay
Grenville Province
Follow-up area
Boundary of structural Province
GRANITE SUITES
Peralkaline
Elsonian
Early Paleohelikian
Hudsonian

Figure 1: *Location of follow-up areas and granitoid geology of central Labrador.*

and/or alteration on which mineral exploration could focus.

Michikamats Lake Anomaly. This area is distinguished in the reconnaissance lake data by very high levels of fluoride in water and moderately high levels of molybdenum in sediment (Geological Survey of Canada, 1978b). The area is underlain by Paleohelikian granite and syenite and is without known mineralization. Lake sediment/water samples and some representative rock samples were collected from 280 km^2.

13L/13 Anomaly. This small area (65 km^2) is distinguished in the reconnaissance lake data by very high F and U concentrations in both water and sediment (Geological Survey of Canada, 1983). The bedrock is granite and typically has 1.5 to 3 times higher than average total count scintillometer readings. Lake sediment/water, stream sediment/water and rock samples were collected.

Anaktalik Brook Anomaly. This anomaly is reflected in the reconnaissance lake water data (Geological Survey of Canada, 1978a) by very high fluoride concentrations, similar to values associated with the Strange Lake Alkaline Complex 100 km to the west, which hosts a large tonnage deposit of Y, Nb, Zr, Be and REE. Lake sediment and water samples and a few stream sediment and rock samples were collected from 140 km^2. Fluorite was observed in some outcrops of granite. Unfortunately, the lake sediment samples from this anomaly were destroyed by fire before any analyses were done.

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GEOCHEMICAL FOLLOW-UP SURVEYS, LABRADOR TROUGH

by

James Butler
Geochemistry and Geophysics Section

Introduction

Follow-up geochemical surveys were conducted in three areas of Labrador during the 1985 field season (Figure 1). One area was northeast of Wabush- Labrador City known as Rannie Lake (A), and two other areas were in close proximity to Schefferville, Quebec: Howell's River (B) to the west, and Iron Arm (C) to the east.

Rannie Lake Area (A)

Previously known as Anomaly 6 (McConnell, 1984), this anomalous zinc area was shown to extend southward from the original anomaly based on reconnaissance lake sediment data (G.S.C. Open File 903). Initially lake sediment and lake water samples were collected from the 230 km² area at a density of 1 sample per 1.8 km².

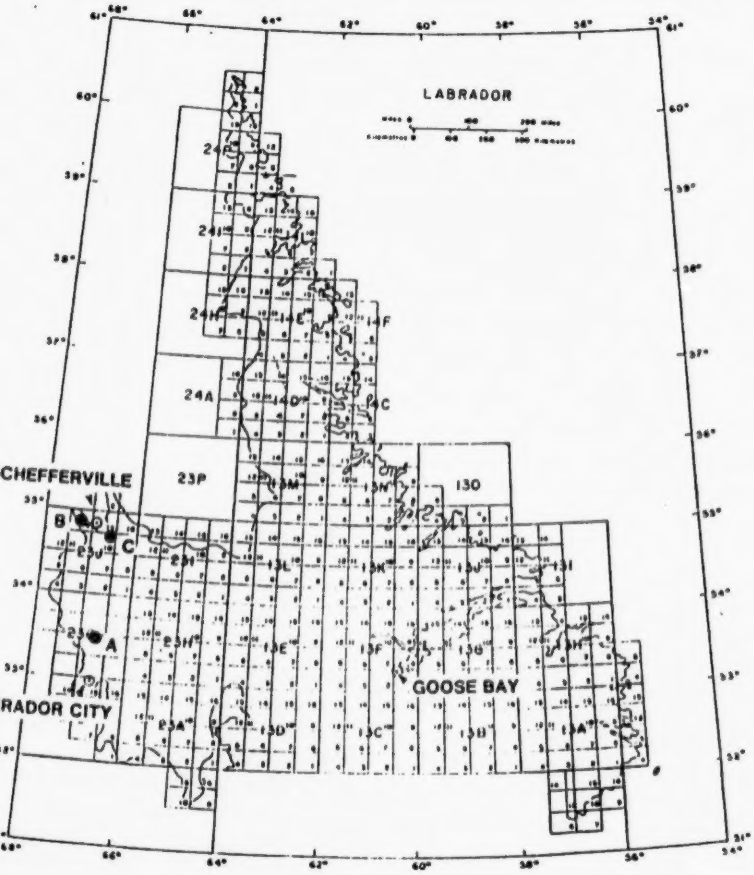

Figure 1: *Areas of geochemical follow-up in the Labrador Trough.*

Then the crews concentrated on sediment sampling every stream within the area at a sample interval of 50 metres. In all, 137 lake sediment samples and 261 stream sediment samples were collected.

The area is covered with glacial overburden to a considerable depth. Eskers are common throughout the northern part of the area, some reaching a height of almost 10 metres. Only three outcrops were noted in the northwest corner of the area, the largest of which is a north striking ridge that is exposed for a distance of about 50 metres. The rock type in this outcrop is homogeneous Menhik Formation shale with very minor quartz veining.

Howell's River Area (B)

The Howell's River area is located west of the town of Schefferville, Quebec, and extends to the northwest. Several of the lake sediment samples collected during the URP surveys (GSC Open File 557) produced anomalous values in zinc. A similar sampling program was conducted here as at Rannie Lake. First, lake sediment and lake water samples were collected, and then stream sediment samples were taken. From an area of about 800 km^2, there were 207 lake water and lake sediment samples and 285 stream sediment samples collected.

The area contained much less glacial overburden than the Rannie Lake area and outcrops were noted at several localities along both the north and south sides of Howell's River. All outcrops were highly fractured, relatively homogeneous, Menihek Formation shale. Minor pyrite was also seen in some outcrops. Some rock samples were collected for analysis.

Iron Arm Area (C)

The Iron Arm area is about 30 kilometres east of Schefferville. In 1981, John McConnell completed a detailed soil sampling program in the area. Soil samples were collected every 50 metres from a grid with a two kilometre baseline and two kilometre crosslines 400 metres apart. Our work extended the baseline for one kilometre to the west and added crosslines at 400 metre intervals on the extension. In addition, three lines, each 500 metres long, were run off both sides of a small lake which intersected line 19+50W at 5+82S. A total of 136 soil samples were collected from the grid extension. The original grid and the extension were also surveyed for rock samples. A total of 83 rock samples from outcrop, probable outcrop and local float were collected.

All samples were analysed for a suite of elements including Cu, Pb, Zn, Co, Ni, Ag, Mn, Fe, F, Cd and loss on ignition. Some selected samples may be analysed for other elements such as Au at a later date. The data will be released on open file when all analysis and statistics have been completed.

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GRAVITY SURVEYS 1985

by

Hugh G. Miller[1]
Geochemistry and Geophysics Section

Gravity surveys were conducted as a cooperative project between the Department of Mines and Energy and Memorial University. Data were collected in five areas: the northern Gander Zone, the Ackley Granite, Third Berry Hill Pond area, along the Burgeo Road, and along a profile traversing the Mount Cormack Terrane (Figure 1).

All data were collected using a Lacoste - Romberg land gravity meter, G172. Elevations were determined by Wallace and Tiernan barometric altimeters using known topographic control elevations as bench marks. All elevations were tied to mean sea level by surveying from the water line and corrected with reference to tide tables. Positions were taken from 1:50,000 scale topographic maps.

Gravity readings were taken at 619 locations, 593 of these at different locations in the five areas surveyed and 26 at repeat stations in these areas. The data were reduced to Bouguer anomalies through the use of standard Canadian Network gravity bases which are in turn tied to the worldwide IGSN71 network. The theoretical gravity at each station was determined using the 1968 International Gravity Formula, and a crustal density of 2.67 g cm^{-3} was used for the Bouguer slab correction. No terrain corrections were considered necessary. The resulting Bouguer anomalies are considered accurate to +/- 0.5 mGal with the main contribution to the uncertainty arising from the 2m uncertainty in the elevation.

The Gander area (Area 1, Figure 1) survey was conducted to provide additional geophysical data for delineating the belt of positive anomalies discovered by Miller and Weir (1982) and confirmed by a further pilot gravity survey (Butler et al., 1984). During the 1985 field season an additional 251 stations were occupied in the area between the Trans Canada Highway in the south and Hamilton Sound in the north, and between the Gambo-Wesleyville road in the east and the Gander Bay road in the west. Access in the area was by boat, woods roads, and helicopter.

The Ackley Granite survey (Area 2) was conducted to complement data collected during a pilot survey in 1983 (Miller, 1984). During the 1985 season, 131 stations, spaced 5 km apart, were occupied along six traverses across the granite. These data add to the existing data base of 52 stations occupied in 1983. All transportation on the survey was by helicopter.

Data in the Third Berry Hill Pond area (Area 3) were collected along four traverses over the granite in the area. Seventy-eight stations were occupied including 22 stations on a profile over the Mount Cormack Terrane (Area 4).

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[1] On sabbatical leave from Department of Earth Sciences, Memorial University of Newfoundland.

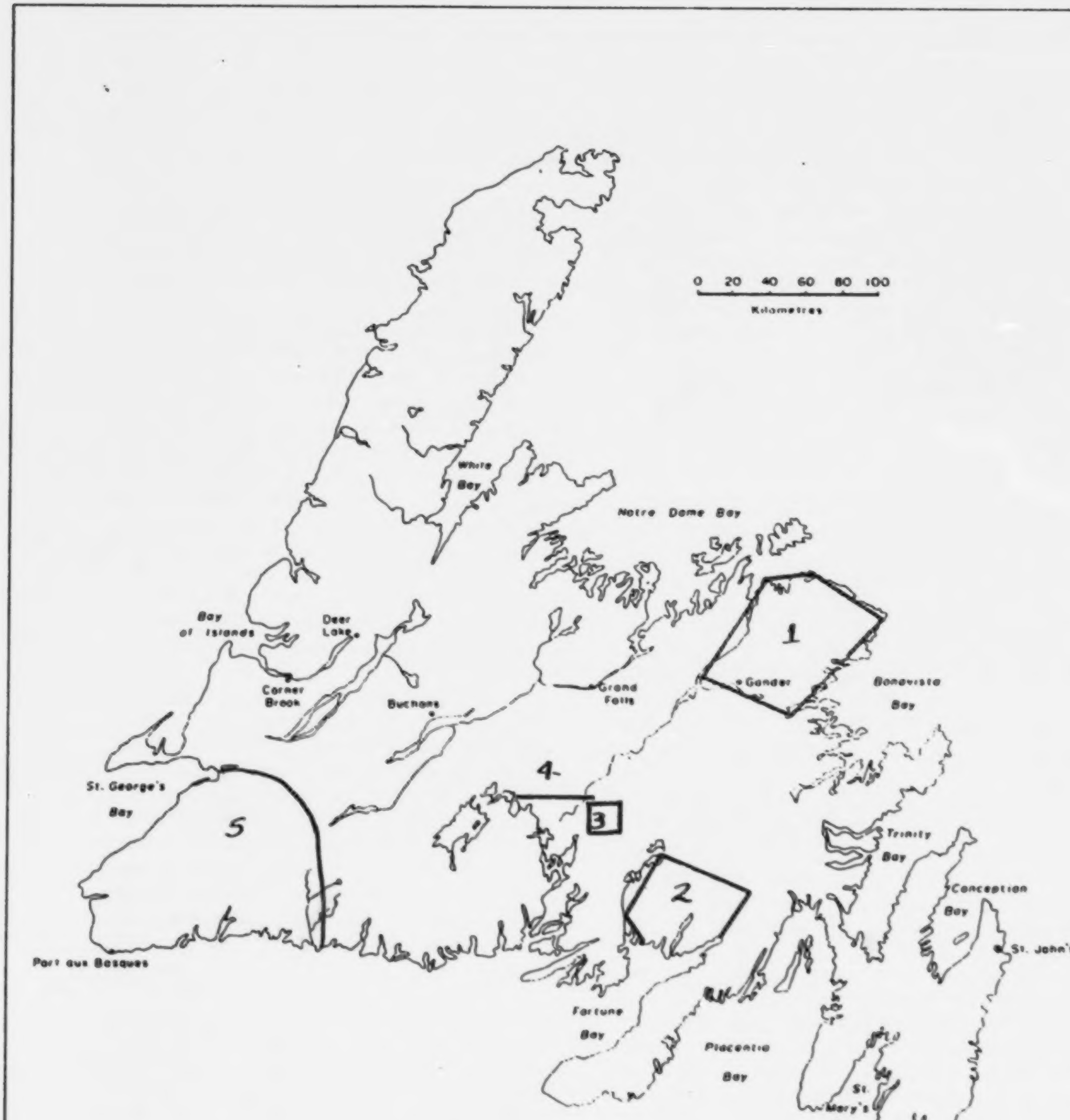
0 20 40 60 80 100
Kilometres
White Bay
Notre Dame Bay
Bay of Islands
Deer Lake
Corner Brook
Buchans
Grand Falls
Gander
Bonavista Bay
1
4
3
St. George's Bay
5
Trinity Bay
2
Conception Bay
St. John's
Port aux Basques
Fortune Bay
Placentia Bay
St. Mary's Bay

Figure 1: *Survey locations for 1985 gravity surveys. Area 1 - Gander; Area 2 - Ackley Granite; Area 3 - Third Berry Hill Pond; Area 4 - Mount Cormack; Area 5 - Burgeo Road.*

A survey consisting of 159 stations at 1 km spacing was also conducted along the Burgeo Road (Area 5).

All Bouguer anomalies determined from the data will be released in Open File reports which will also contain the gravity data from previous Memorial University and Earth Physics Branch surveys in the various areas.

Acknowledgements

The author wishes to acknowledge and thank the field crew of Roger O'Regan, Ewan Cumming, and Tim Gregory who were responsible for the data acquisition in the field and for the processing of the data.

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1984: Ackley Batholith gravity survey. *In* Current Research. *Edited by* M.J. Murray, J.G. Whelan and R.V. Gibbons. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 84-1, pages 254-256.

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GEOPHYSICAL INVESTIGATIONS - ELECTROMAGNETICS AND MAGNETICS

by

Joan Tod
Geochemistry and Geophysics Section

The initial field season for formal, in-house, geophysics was divided between two projects in Labrador and two in insular Newfoundland. These areas were chosen on the basis of prior geochemical and geological investigations; geophysical follow-up was aimed at assessing mineral potential.

The Labrador projects were joint geophysics/geochemistry endeavors. Both project areas are underlain by drift-covered Menihek shales, adjacent to the Sokoman iron formation. In general, the geophysical work consisted of establishing a grid over which VLF-EM, scintillometer and magnetic surveys were conducted; the geochemistry work centered on sampling the lake and stream sediments in the surrounding area (see Butler, this report).

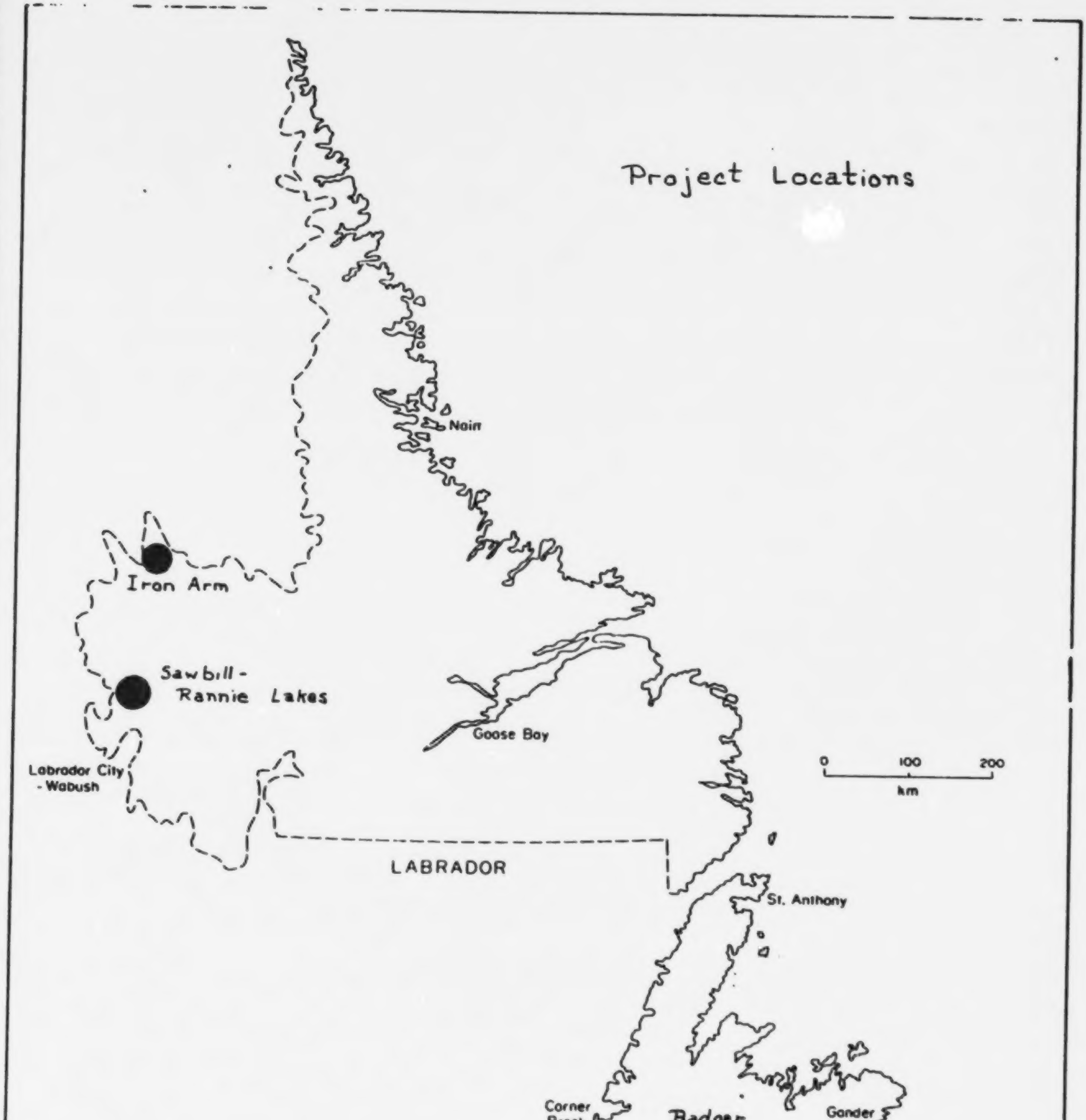
Regional geochemical and aeromagnetic data were used to determine the location of the first grid, which was established between Sawbill and Rannie Lakes. It entailed 6.6 km of cut lines, along which VLF-EM, magnetic and scintillometer readings were recorded at 25 m intervals. One line of induced polarization values was recorded as well.

The second grid was originally established by J. McConnell in 1980, for the purpose of geochemical analysis. This 2 x 2 km grid is located east of Schefferville, Quebec, towards Iron Arm. VLF-EM and magnetic values were recorded at 25 m intervals over the area.

Data analysis should answer questions regarding the nature of the bedrock geology, and the potential of geophysical methods to locate shale-hosted base-metal mineralization in this environment.

Work in Newfoundland was aimed at accurately mapping two poorly exposedareas. On the Port au Port Peninsula, the contact between the Table Head (Ordovician) and Codroy (Carboniferous) formations is drift covered over the central portion of the peninsula. A known deposit of celestite-barite (Ronan deposit) occurs along this contact and the possibility of either similar deposits, or associated sulphide mineralization, prompted this attempt to trace out the contact using VLF-EM. Although access to the area of interest was limited by dense vegetation, stream beds and old cut lines were used to put in 11 traverse lines along the projected length of the contact.

The fourth study, undertaken in the Badger area, was a ground follow-up of airborne-identified anomalies. A Caradocian graphitic shale unit traverses this area and is mappable on the basis of its electromagnetic response. Results of the 1983 Geological Survey of Canada gradiometer/VLF airborne survey (Geological Survey of Canada open file number 1049) suggested some local modifications to the assumed map pattern of this shale unit. Traverses of ground VLF-EM were taken over the areas in question.


Project Locations
Nain
Iron Arm
Sawbill-
Rannie Lakes
Goose Bay
Labrador City
- Wabush
0
100
200
km
LABRADOR
St. Anthony
Corner
Brook
Badger
Gander
Port au Port
Peninsula
St. John's
Port aux
Basques
NEWFOUNDLAND

QUATERNARY GEOLOGY

QUATERNARY MAPPING/DRIFT PROSPECTING, MORAN HEIGHTS, LABRADOR

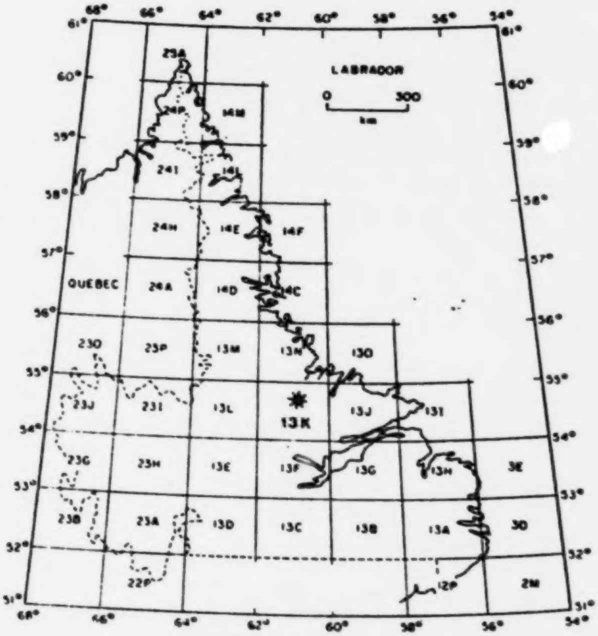
by

Doug Vanderveer
Quaternary Geology Section

Quaternary mapping at a detailed level commenced in 1984 at the request of Saarberg Interplan in an attempt to define the source of uranium bearing boulders on the Moran Heights Property. As a result of field work in 1984, it was concluded that the mineralized boulders occurred in glacial till (Vanderveer, 1985) and not in colluvium as had been previously assumed (Perry, 1980). In addition, two glacial flows were identified, an earlier flow to the east-northeast and a subsequent flow to the north. The latter flow appears to have been responsible for the construction of lateral moraines on both sides of the valley and a small recessional moraine across the north end of the lake (Vanderveer, 1985).

Field work this past summer involved the collection of additional till and pebble samples, both within the area sampled in 1984 (i.e., to provide a sample density of one sample per 50m along grid lines spaced 200m apart) and to extend the grid area sampled to the north and to the south. In addition, these traverses also assisted in refining the locaton of the lateral and recessional moraines in the area. The moraine at the north end of the pondis not as extensive as previously assumed from earlier airphoto analyses. This moraine is limited to the west side of the pond. The other main ridge across the north end of this pond is bedrock with a thin mantle of glacial till.

Preliminary results from the 1984 field work had identified a zone of anomalous uranium values in till that extended in both a down ice direction and in an up ice direction from the known boulder concentration. Although results are not yet available from the 1985 sampling program, it is expected that these results should refine the geochemical dispersal pattern of U in till and define the southern limit of this dispersal fan in the up ice direction.



INDEX MAP

The main known boulder concentration is located approximately in the central portion of this dispersal pattern. These boulders are interpreted as having been transported to the north, and the definition of the southern extent of the anomalous U values in till will be of assistance in the selection of a revised target area for follow-up drilling.

Current plans include: (a) completion of the till geochemical analyses, (b) revision of the Quaternary map for the area, and (c) preparation of a joint Mines and Energy-Saarberg Interplan report which will summarize the following: (i) the history of exploration, (ii) current exploration activities, (iii) the glacial deposits and direction of transport, and (iv) the geochemical dispersal of the mineralization in soils and till.

Acknowledgements

The author wishes to thank Saarberg Interplan (Holger Quarch) for their agreement to participate in this study and for the provision of camp facilities. In addition, the author extends thanks to Tim Froude, on site geologist, and Karen Roberts, field assistant to Richard Wardle. Karen and Tim were of great assistance in completing the sampling despite less than ideal weather conditions.

References

Vanderveer, D.G.
1985: Quaternary Mapping Moran Heights, Labrador and Gander-Gambo Area, Newfoundland. In Current Research for 1984, Edited by K. Brewer, D. Walsh and R.V. Gibbons. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 85-1, pages 55 to 58.

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1980: Annual exploration report for 1980, Canico-Brinex joint venture, Moran Lake area. N.T.S. 13J, 13K. License number 1528BX-1533BS, Canadian Nickel Company Limited. Newfoundland Department of Mines and Energy, File Lab. (592).

QUATERNARY MAPPING AND DRIFT EXPLORATION IN THE LETITIA LAKE AREA, LABRADOR

by

Martin Batterson and Paul LeGrow
Quaternary Geology Section

Introduction

Beryllium and niobium mineralization occurs within radioactive syenite gneiss boulders in an area just west of Two-Tom Lake, which lies to the east of Letitia Lake in Central Labrador (54°14'N 62°10'E). Westoll (1971) recorded low assay values for boulders, in contrast to the 1 percent beryllium and 1 percent niobium values recorded by Doak (Westoll, 1971). It was to investigate this contrast that the area was studied.

The Letitia Lake project consisted of two components: regional Quaternary mapping (i.e. northern part of 13L/1 and southern part of 13L/8) and detailed drift exploration. The former aimed at characterizing the area both in terms of terrain features, e.g., flow indicators and till stratigraphy, and the geochemical profile of tills throughout the area. Detailed drift exploration involved an airborne and ground scintillometer survey, geological mapping, and a biogeochemical survey, a combination designed to locate mineralized boulders, their bedrock source and their dispersal pattern. Through this approach it is hoped to generate an exploration model for the Two-Tom Lake area.

Geological Setting

Massive, granite-feldspar porphyries of the Letitia Lake Group are the predominant rock type in the study area (Thomas, 1981). A number of peralkaline syenite exposures of the Red Wine Alkaline Intrusive Suite occurs in the area. These syenites host the Mann Be-Nb deposits found in the western part of the study area. The southern part is underlain by undifferentiated granites to diorites of the North Pole Brook Intrusive Suite; north of Letitia Lake, sedimentary and volcanic rocks of the Seal Lake Group predominate.

Regional Quaternary Mapping

This component of the Letitia Lake project involved detailed checking of an air-photo interpretation of terrain features, determination of ice flow directions, and till sampling for both geochemical and lithological analysis. Till sampling was completed on a 2 x 2 km grid spacing. In most areas a sample was collected from below the B horizon in either a BC or C soil horizon. Clasts in the 16 to 32 mm size range were collected for lithological analysis. Sampling was hampered in some areas because of the extremely bouldery surface mantle.

There is evidence for three separate flow events within the area, although not everywhere at the same site: one towards 046; another ranging from 096-098 in the south to 114 in the north; and a dominant flow ranging from 080 in the south to 074 in the north. On the basis of crossing striae relationships and earlier straie preserved in the lee of more recent flows, the 046 flow direction is the oldest and the 080-074 the youngest. The terrain features, and in some respects the lithological characteristics, all conform to the most recent flow event. It is expected that the geochemical patterns will also reflect this flow.

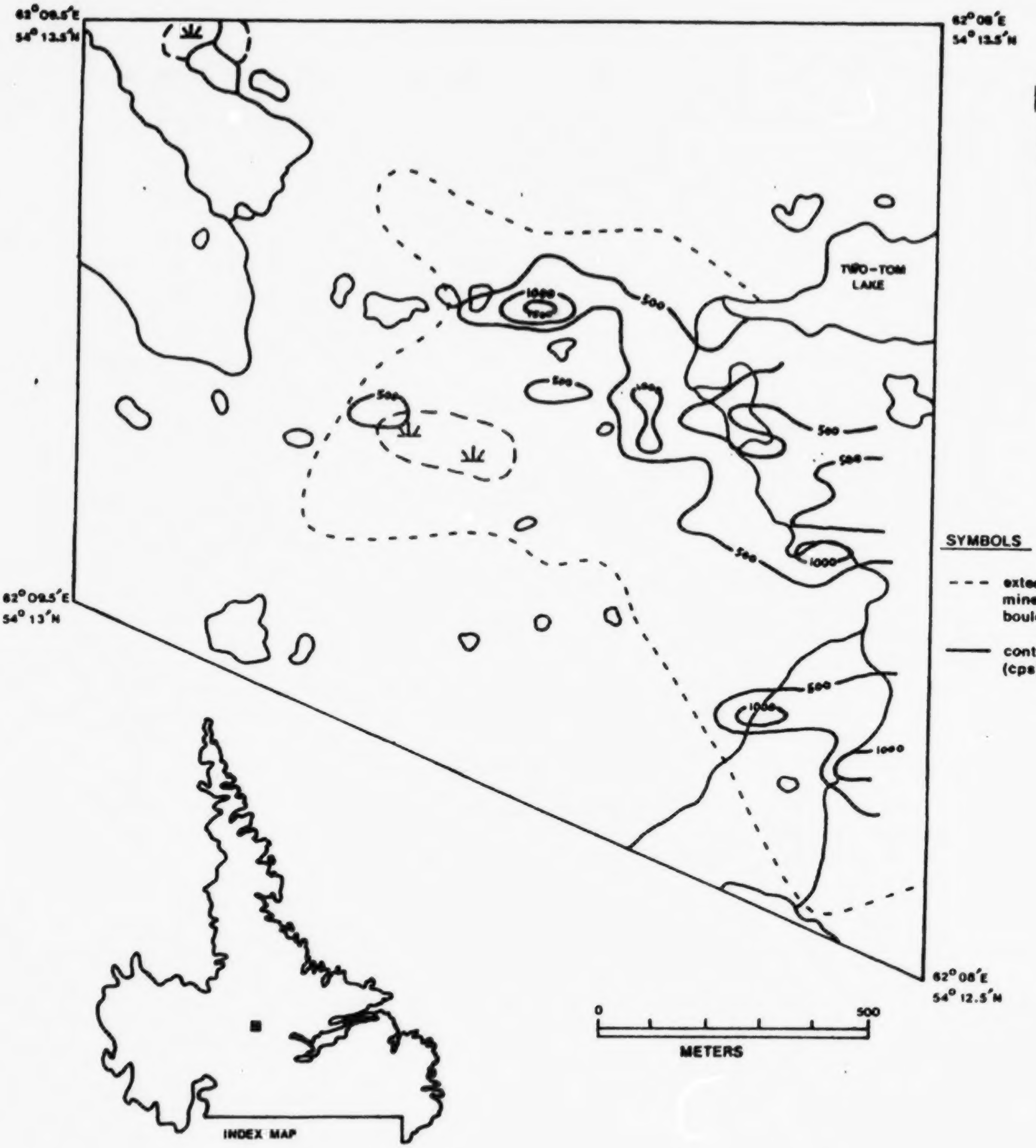
62° 09.5'E
54° 13.5'N
62° 08'E
54° 13.5'N
N
TWO-TOM LAKE
1000
500
1000
500
1000
500
500
500
1000
500
1000
1000
SYMBOLS
extent of mineralized boulders
contour line (cps)
62° 09.5'E
54° 13'N
62° 08'E
54° 12.5'N
0
500
METERS
INDEX MAP

Figure 1: *Ground scintillometer survey of Two-Tom Lake area, central Labrador.*

Detailed Drift Exploration

An initial airborne scintillometer survey was completed over the study area using a GRS 500 Differential Spectrometer. This survey was augmented by a reconnaissance ground survey to determine the approximate extent of mineralized boulders. On this basis, a grid consisting of 100 metre lines and 50 metre stations over an area of 1.2 km x 1 km was established, yielding a total of over 250 stations. At each site boulders were mapped and sampled, and scintillometer readings recorded. In addition, a biogeochemical survey was undertaken in which black spruce (Picea Mariana) samples were collected at each station over a 2 day period.

Initial results from both the ground and airborne scintillometer surveys reveal a series of anomalous areas which appear to correspond to known concentrations of mineralized boulders (Figure 1). In addition, several areas of previously unmapped mineralized gneissic syenite bedrock were identified.

Follow-Up Work

Till (200), rock (80) and biological (250) samples will be analysed for Cu, Pb, Zn, Co, Ni, Mn, Fe, Be, Li, Cd, Mo and F by atomic absorption spectrometry; Ba, Cr, Ga, La, Nb, Rb, Sr, Th, V, Y, Zr and Ce by an inductively coupled plasma spectrometer; and U by neutron activation. Lithological analysis of clasts should aid in the determination of glacial transport distances and directions.

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1981: Geology along the Southwestern Margin of the Central Mineral Belt. Report 81-4, Mineral Development Division, Newfoundland Department of Mines and Energy.

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1971: Geological Report on the Two-Tom Lake Area, Seal Lake, Labrador. British Newfoundland Exploration Limited, Document No. G71065

DETAILED AGGREGATE RESOURCE PROJECT - INSULAR NEWFOUNDLAND

by

F.T. Kirby
Quaternary Geology Section

Most of the 1985 season was spent in the office compiling open file reports and maps on St. Anthony, (2M/5 and 6), Sops Arm - Jackson Arm (12H/10 and 15), and Deer Lake (12H/3) areas. A detailed report on aggregate resources in the northeast Avalon Peninsula area, which includes Carbonear, Harbour Grace, Holyrood, St. John's, and Bay Bulls, has commenced.

During the first two weeks of August, detailed aggregate assessments were conducted in the St. Barbe and Norris Arm areas. Results of the survey in the St. Barbe area has shown that all accessible surficial aggregate deposits have been nearly exhausted. Where not exhausted, other land uses hinder quarry development.

In the Norris Arm area (Figure 1), backhoe testpitting was utilized to determine the extent, depth and quality of a large predominantly sandy gravel deposit. In total, 14 backhoe test pits were dug at preselected sites throughout the area, confirming preliminary studies which indicated extensive reserves of predominantly sandy gravel. Cabin development along the shore of the Exploits River and along the old Norris Arm Highway has, however, sterilized a large portion of the reserves in the area. Land use plans will have to be updated, and further expansions of conflicting developments curtailed, if access to a source of aggregates is to be maintained in this area.

A geological technician was hired to conduct quarry inspections and quality and quantitative analyses in areas where conflicts between quarry development and other land uses exist. This work has had a combined regulatory, resource management, and educational or training influence on quarry operations. Illegal operations have been closed, improper operations have been directed to clear up problem areas and considerable time has been spent instructing operators on techniques of rehabilitation and resource management.

All open file reports should be completed and released by the end of November. The detailed report on the northeast Avalon area should be completed by the end of March.

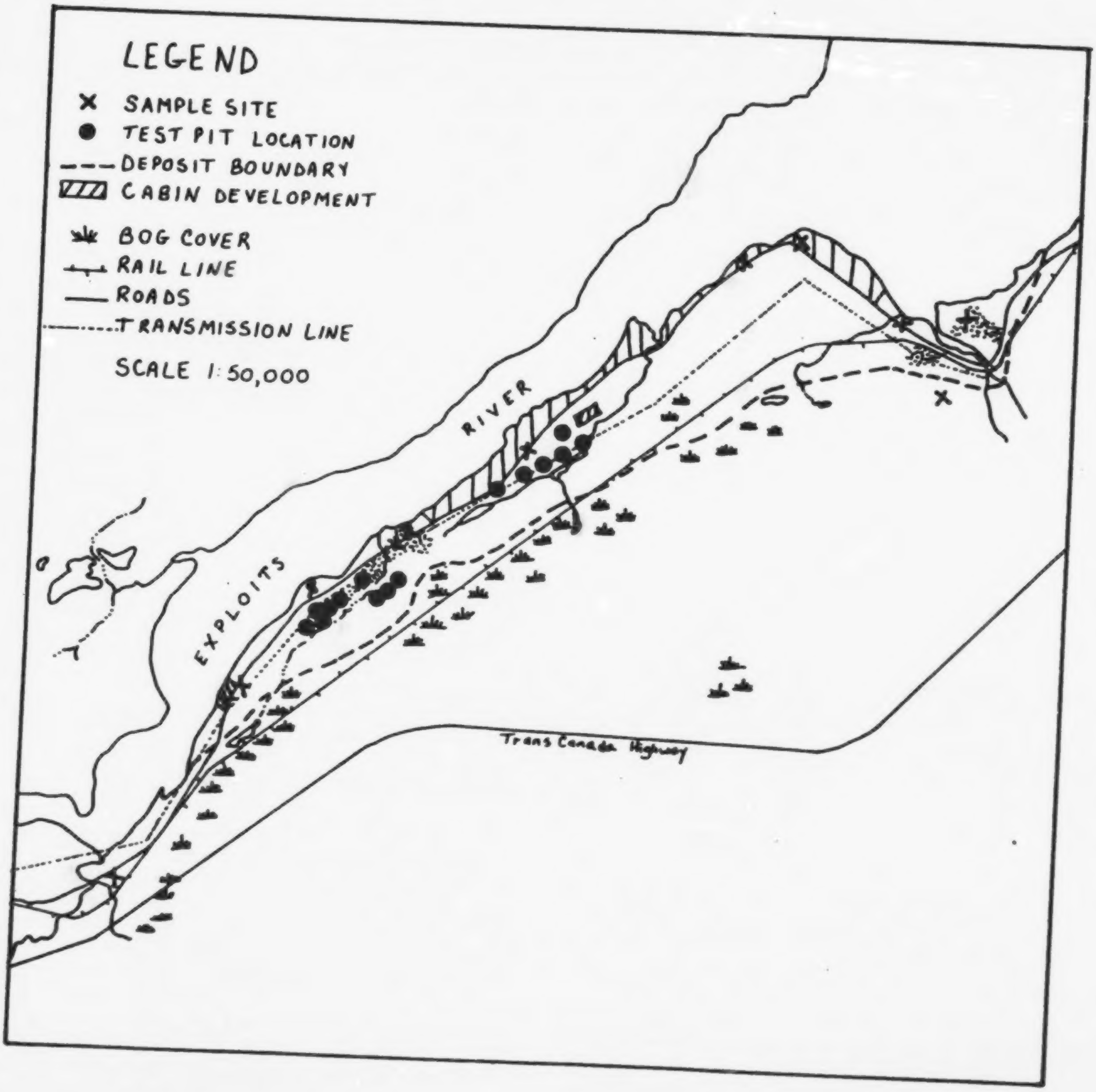

LEGEND
× SAMPLE SITE
● TEST PIT LOCATION
--- DEPOSIT BOUNDARY
▨ CABIN DEVELOPMENT
BOG COVER
RAIL LINE
ROADS
TRANSMISSION LINE
SCALE 1:50,000
RIVER
EXPLOITS
Trans Canada Highway

Figure 1: *Old Norris Arm Study Area.*

RECONNAISSANCE STUDY OF BEDROCK AGGREGATE POTENTIAL FOR OFFSHORE AND INDUSTRIAL USE

by

Dan Bragg
Quaternary Geology Section

During the 1985 field season an evaluation of the aggregate potential of bedrock quarries on the Burin and Avalon Peninsulas was carried out (Figure 1). This assessment was done to determine the quality and quantity of bedrock for offshore and industrial use.

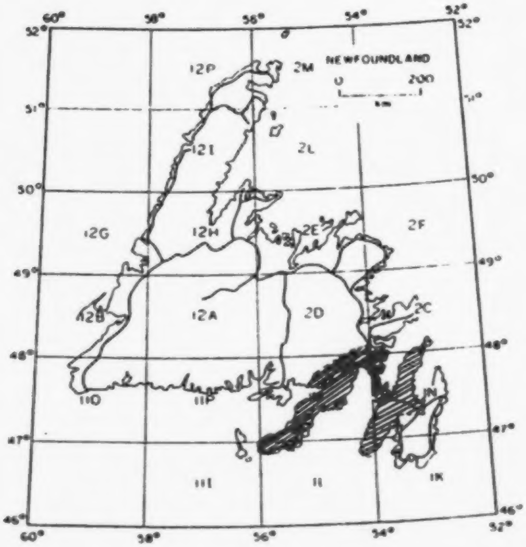


Figure 1: *Field area coverage for bedrock aggregate during the 1985 field season.*

Field work consisted of traverses along the highway and side roads, and visiting all rock quarries. Road-cuts were sampled in areas where no rock quarries exist.

For the first six weeks of the field season work was centered around the Burin Peninsula, with special emphasis placed on the Marystown (Spanish Room) area. The last two months of the season were spent on the Avalon Peninsula with special emphasis placed on the Come by Chance and Adam's Head areas.

The field investigation for each site consisted of determining, where possible, ownership and use of each quarry. Rock type, overburden, weathering, geological structures, mineralization, veining and alterations were also noted.

During the field investigations, rock samples that ranged from 14 to 45 kg were taken for laboratory testing. This testing includes $MgSO_2$ soundness test and Los Angeles Abrasion testing, both of which will be done by the Newfoundland Department of Transportation. If the results of these tests are favorable, the samples will be further tested for Alkai-reactivity. In-house petrographic analysis will be done using hand specimans and thin sections.

A total of 256 sites were visited during the summer and 286 samples taken. Eight sites with potential for offshore use were discovered and data on these and other sites should be available by the end of 1985 or early 1986.

Acknowledgements

The author wishes to thank Mr. Glenn Norman, a hard working and capable assistant.

QUATERNARY MAPPING AND EXPLORATION IN THE TRAPPER PROSPECT AREA, WESTERN NEWFOUNDLAND

by

MaryAnn Mihychuk
Quaternary Geology Section

Detailed sedimentological investigations of Quaternary deposits in the Bellburns (12I/5 and 6) area, from the coast westwards to the Long Range Mountains, were conducted during the 1985 field season. The study concentrated on the area of the Trapper mineral prospect where numerous high grade mineralized boulders have been identified. The aim of the program was to evaluate the depositional environment of the sediments and boulders, and to determine possible source areas. The field program consisted of two major phases, regional mapping and detailed sedimentological exploration.

Regional Program

Mapping was conducted at 1:12,500 scale with concentration on the sedimentological characteristics of the surficial deposits, and on the regional ice flow pattern. The study area is divided into four lithogenic units (Figure 1).

Limestone and dolostone (Unit 1) of Lower Cambrian to Middle Ordovician age is exposed at the base of the Long Range Mountains, and along the coastline. Bedrock is locally exposed on topographic highs, which are apparently structurally controlled, and in the lowland plains near the coast. The Trapper Prospect is in the St. George Group and consists of a flat-lying, 0.3 m thick bed of psuedobreccia, heavily mineralized by sphalerite (Pegg, 1964; Lane, 1980). Mineralized boulders of high grade ore occur 1 to 3 km west of the prospect.

Glaciogenic material (Unit 2) consists of a wide range of sediments, including glaciolacustrine/glaciomarine stratified sand and silt, glacial water-lain deposits of flow and meltout till facies, and glaciofluvial outwash. In the Trapper area, well to moderately sorted silty-sand containing minor pebbles grades into unsorted to very poorly sorted, massive, sandy flow till with local sand lenses. Mineralized boulders overlie the stratified sands, which range from 40 to 90 cm in thickness. These sediments were apparently deposited in an ice dammed water deposit, allowing for the sedimentation of fines with the ice front in close proximity.

Marine sediments (Unit 3) cover most of the study area and consist of a wide range of facies, primarily sand with minor rounded pebbles, moderately to well sorted and commonly containing shell fragments; the shells were used to define the marine limit at 120 m. Shoreline deposits of well sorted, well rounded gravels are well developed along the coastline to approximately 60 m a.p.s. Fourteen localities were identified where shell debris would permit C^{14} dating. In several localities the sediments showed no apparent bedding, were very poorly sorted and had abundant amounts of grit and pebbles. This facies was particularly difficult to differentiate from meltout or flow tills. Bogs (Unit 4) cover extensive areas along the coastal flats, generally overlying marine sediments or bedrock.

Regional sampling was conducted over the whole area; marine and glaciogenic sediment samples were analysed for zinc using a field test. Several areas which were anomalous were identified and used for the selection of the detailed sampling program area. Anomalous values were found 1.2 km northwest of the Trapper and 1.0 km west.

Detailed Sampling Program

A line and compass grid was established in the Trapper Prospect area to include the deposit and mineralized float. Sites were conducted at 250 m interval spacing, with soil profile samples, mineralized boulder chips and pebble counts collected. A great deal of difficulty was encountered because of very thick vegatation. A skidder mounted backhoe was employed for one week, during which time 23 trenches were dug, providing exposure tc bedrock in most cases.

Follow-up Analyses

- Samples will be analysed for Cu, Pb, Zn, Co, Ni, Mn, Fe, Cd, L.O.I.
- Geochemical analysis of the 80 and 250 mesh and separated clays.
- Grainsize analysis of selected samples.
- C^{14} dating of shell material.

References

Lane, T.,
1980: Report on the Geology of the Trapper Claims, Daniel's Harbour, Newfoundland; Teck Exploration Limited Report 841 T. Newfoundland MDD File - 12I/6 (133)

Pegg, C.W.,
1964: Report on exploration and development carried out by Leitch Gold Mines Ltd., period ending July 10, 1964. Newfoundland MDD File - 12I/(23)

LEGEND

4	Organic Deposits - peat, muck, poorly drained areas
3	Marine - gravel, sand, silt; commonly including shell material
2	Glaciogenic - glaciofluvial, glaciomarine; till, gravel, sand and silt, flow, meltout and lodgement till facies
1	Bedrock - carbonate sediments

SYMBOLS

LAST ICE FLOW DIRECTION ⇨

Cross Valley recessional moraines ⁘

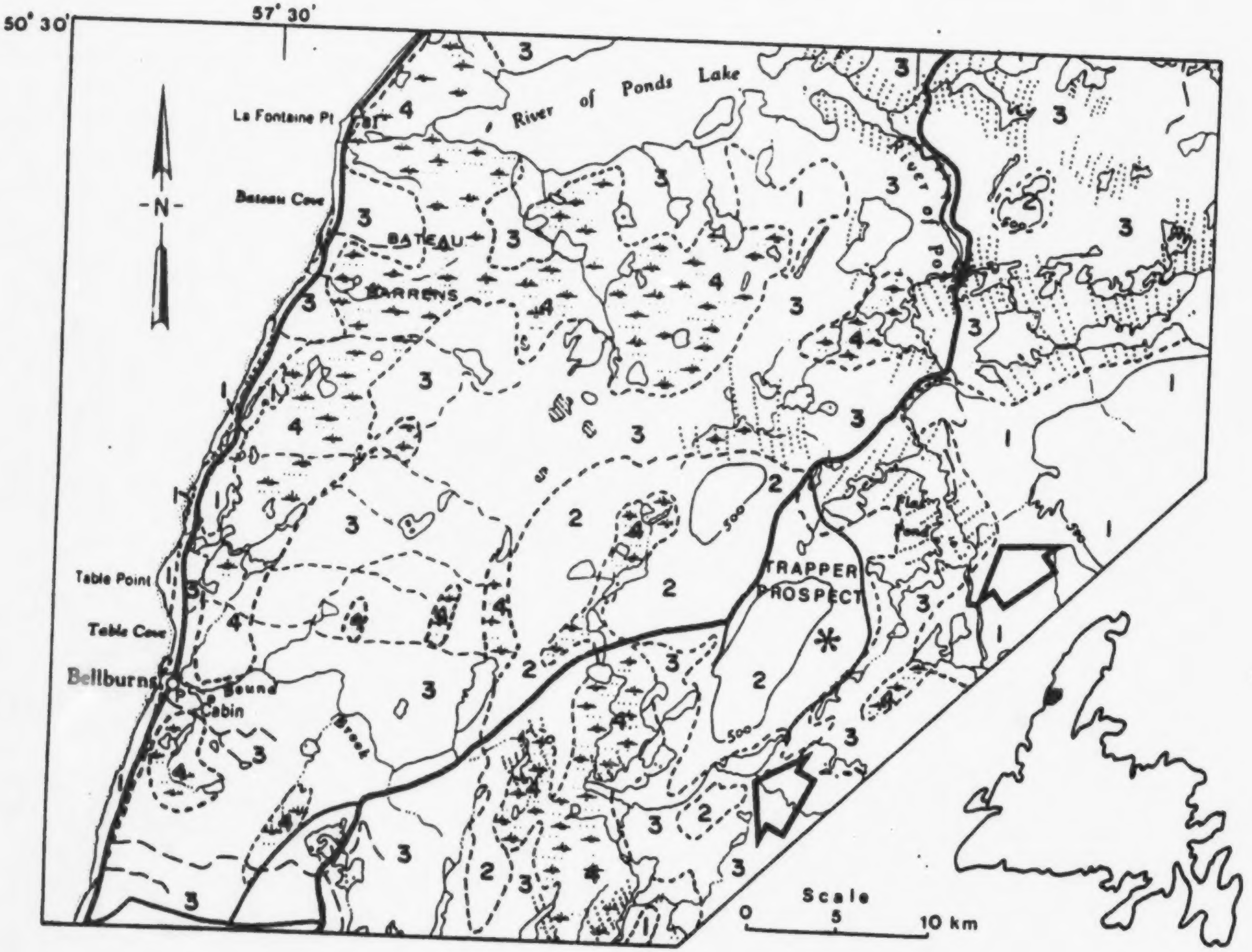

50° 30'
57° 30'
-N-
La Fontaine Pt
Bateau Cove
BATEAU
BARRENS
River of Ponds Lake
River of Po
Table Point
Table Cove
Bellburns
Bound
Cabin
Brook
TRAPPER
PROSPECT
Flat
Ponds
500
1
2
3
4
Scale
0
5
10 km

Figure 1: *Generalized surficial geology in the Trapper Prospect Study area.*

SURFICIAL AND GLACIAL MAPPING - PETER SNOUT (11P/13) AND KING GEORGE IV LAKE (12A/4) MAP AREAS, SOUTHERN NEWFOUNDLAND

by

Byron G. Sparkes
Quaternary Geology Section

During this past field season, mapping was conducted in the Peter Snout (11P/13) and King George IV Lake (12A/4) map areas (Figure 1). This project is a continuation of the provincially funded Surficial and Glacial Mapping Program, designed to provide information on the glacial geology and till geochemistry, as an aid to exploration in areas of mineral potential and/or recent exploration activity. The area has limited access except for the Burgeo road which crosses the eastern part of both map areas.

Field work was started in early June and continued until late August. Six hundred till samples were collected on a 2 x 2 km grid spacing. In most of these locations, the sample was taken from below the B horizon, in either the B-C or C soil horizon. A representative pebble fraction (16 to 32 mm) was obtained to determine the lithologic composition of the till and to aid in the interpretation of ice flow direction and transport distances. The fine sand to clay size fraction (-80 mesh) of these till samples will be analysed for Cu, Pb, Zn, Co, Ni, Ag, Mn, Fe, Mo, U and Au. Particle analysis of approximately 300 samples will be done to determine any differences in the texture of the matrix regionally and between different types of landforms.

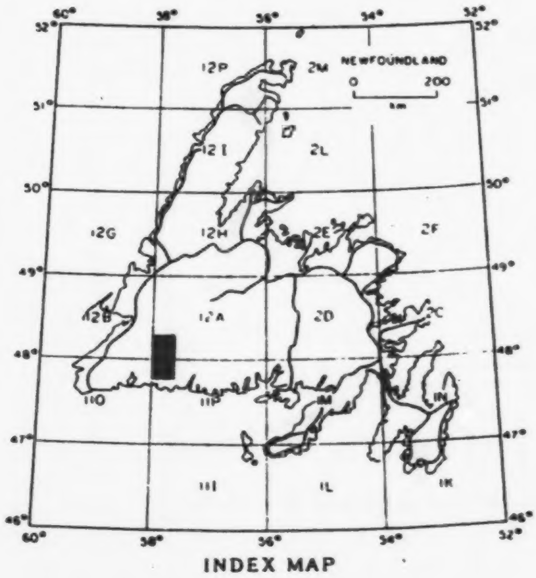


Figure 1: *Location of study area.*

Ice flow in the Peter Snout map area (Figure 2) is generally southerly (180 to 210°). Numerous drumlins, till ramps, and crag-and-tail hills, scattered across the whole map area, are good indicators of this ice movement, which appears to be controlled by the underlying topography, e.g., flow parallels Grandy's Brook.

In the King George IV Lake map area, ice flow is more varied. Ice flowed to the southwest, parallel to Peter Strides Pond, in the northeast corner of the map area, southerly in the central part of the area, and westerly in the northwest corner near King George IV Lake. These divergent flows may be attributed to relatively thin ice conditions, which result in ice flow being controlled by topography and the direction of regional slope.

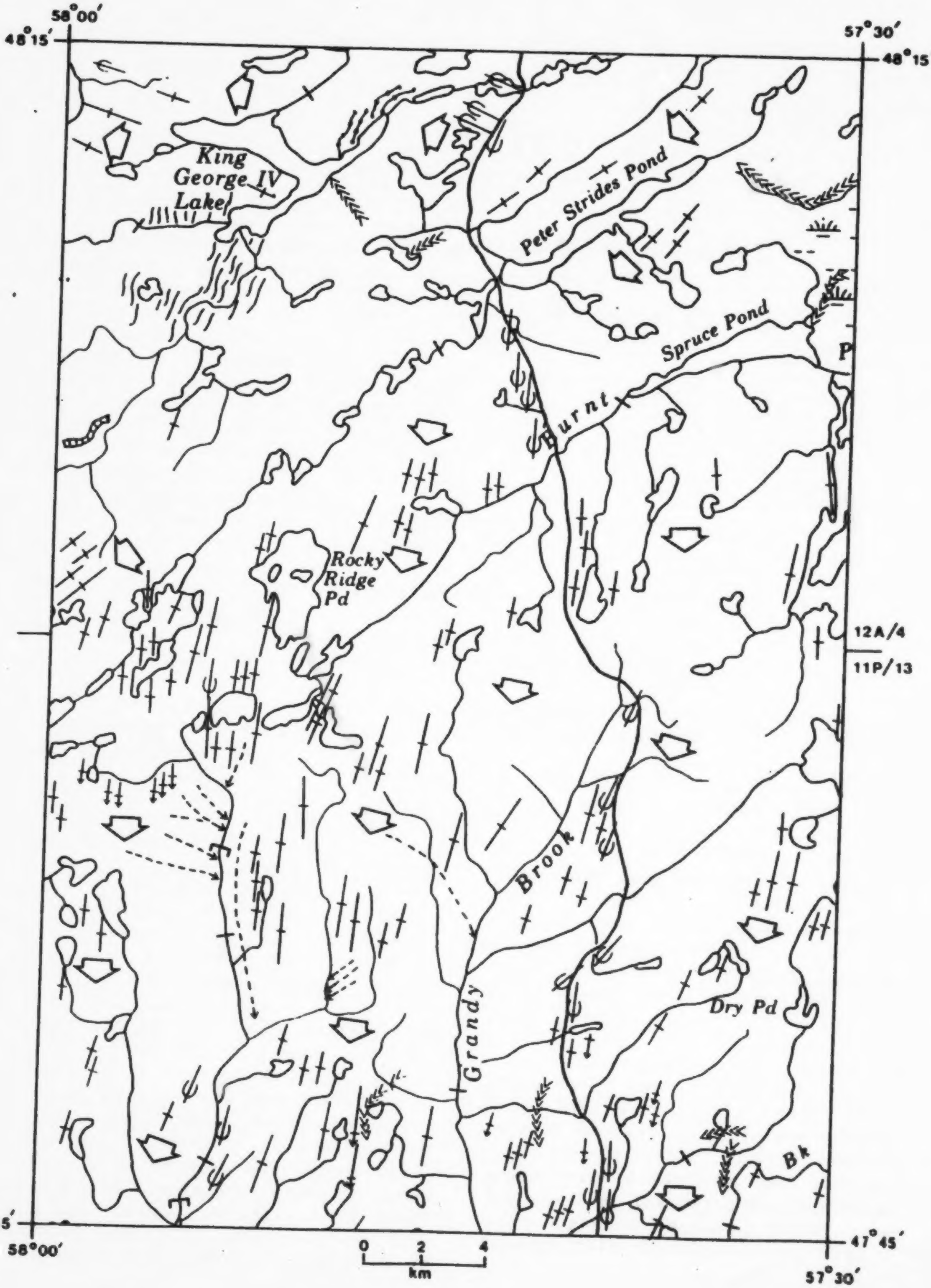
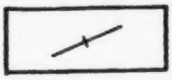
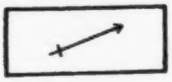

58°00′
48°15′
57°30′
48°15′
King George IV Lake
Peter Strides Pond
Spruce Pond
P
Burnt
Rocky Ridge Pd
12A/4
11P/13
Brook
Grandy
Dry Pd
Bk
47°45′
58°00′
47°45′
57°30′
0
2
4
km

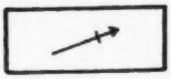
Figure 2: *Regional ice flow features 11P/13, 12A/4.*

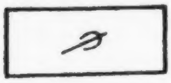
SYMBOLS

Longitudinal ice-flow features

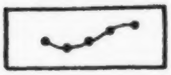
 Drumlin, drumlinoid, fluting

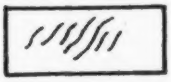
 Crag-and-tail hill

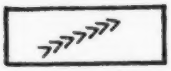
 Till ramp

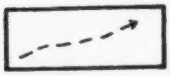
 Striation

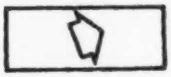
Transverse ice-flow features

 Crestline of prominent moraine

 Ribbed moraine, DeGeer moraine, minor moraine

 Esker, crevasse filling

 Abandoned channel of former meltwater stream

 Direction of regional ice flows

DETAILED AGGREGATE MAPPING RELATED TO CONCRETE PLATFORM CONSTRUCTION

by

Jerry Ricketts

Construction of concrete platforms will require large amounts of sands and gravels to be available on a continuous basis during the construction period. For this reason, detailed aggregate studies were conducted in areas of potential resource development, within reasonable distances to possible construction sites. Since construction will take place in a coastal area, most sampling was conducted in shoreline deposits.

The objectives of the project were to determine the quantity and quality of aggregate material in deposits where mining may occur. These objectives were achieved by detailed sampling to provide material for petrographic analysis, sieve size analysis and alkali reactivity testing. Heights of shoreline exposures and depths of hand dug test pits were also taken.

Potential aggregate extraction areas, for cncrete production, were sampled in the Placentia Bay area between Southern Harbour and Pipers Hole near Swift Current. Limited field work was also conducted in the Marystown (1M/3) map area in order to inspect and sample aggregate zones not sampled in previous years.

Most of the work during the field season was conducted in areas around Swift Current. A large aggregate deposit on the southwest bank of Swift Current can easily be mined and transported by barge to construction sites. This deposit contains coarse, medium and fine sands, gravels, sandy gravels, clays and silts. The Swift Current deposit is approximately 2800 m long, 700 m wide and 4 to 11 m in height; it is dissected by three small intermittent streams. The deposit is overlain by dense forest growth and 30 to 40 percent bog cover. The A and B soil horizons reach depths of one meter in several locations.

Another deposit sampled near Swift Current is the Pipers Hole deposit, originally sampled in 1978 by Fred Kirby under the Inventory of Aggregate Resource program. The deposit is approximately 75 to 80 percent sand with some silt; the remainder is sandy gravel and gravel. It is overlain by a veneer of gravel in most areas. The Pipers Hole deposit is presently being used by the Department of Transportation for road sands during the winter months. It has now been quarried for more than 15 years and is approximately 20 percent mined out.

A second deposit was sampled in the area east of Vicuna Island on the eastern side of the entrance to Black River Cove. This deposit is composed predominantly of sand size material. It is approximately 300 m long, 300 m wide and has a maximum height of 11 m, which tapers off toward both ends. Small deposits of compacted tills and minor gravel are located south of the sand deposit.

A large deposit of sands and gravels was sampled in North Harbour. This shoreline deposit is the second largest deposit of sands and gravels, next to the Swift Current deposit. Approximate dimensions are 1300 m x 200 m x 7 m. The North Harbour River, a designated salmon river, runs through this deposit.

Less extensive deposits were sampled in Woody Island, Jack's Pond Park near Arnolds Cover and Bittern Cove. The largest of these deposits is at Woody Island. A marine terrace in this area, composed of sandy gravels and sands, is approximately 300 m long, 200 m wide and 8 to 12 m high.

Deposits of low potential were sampled at Muddy Hole and Baker Cove. Two eskers were sampled in an area 3 km west of Ryers Hole Park. These eskers have excellent petrographic qualities but are too small (each approximately 1100 m long and 7 to 13 m high) and too far inland (1 to 1.5 km from road) to be considered.

Sampling was conducted at 200 to 300 m intervals in most deposits. In total, 292 samples were collected for particle size and petrographic analysis. Twenty of these samples were arbitrarily selected for alakali reactivity testing.

GENERAL PROJECTS

CORE STORAGE PROGRAM, 1985

by

A. Harris and S. Cochrane
Publications and Information Section

During 1979, the Newfoundland Department of Mines and Energy started a drill core collection and storage program. The objective is to provide well maintained and representative collections of drill core from as many drilling programs as possible for the future use of the mineral exploration industry, government geoscientists, university geoscientists and other geotechnical people.

Drill Core Collection

During the 1985 field season, drill core collection continued in insular Newfoundland, and in western Labrador. In insular Newfoundland, 23,106.2 m of core was collected from ten drilling projects and in western Labrador 1,513.0 m of core was acquired from drilling in the Labrador Trough. To date, the core storage program has collected 173,631 m of drill core, of which 133,904 m is classified as "open" and is available for inspection by interested persons.

The core storage program is presently storing 39,727 m of core from 15 drilling projects on a confidential basis. Requests for confidential storage are treated on an individual basis. Conditions and terms of confidential storage are tied to land status and are similar to the terms and conditions of confidentiality which apply to assessment reports.

Drill Core Libraries

The Department of Mines and Energy operates three drill core libraries, located in St. John's, Pasadena and Goose Bay.

The St. John's library is staffed on a full-time basis, except during the field season. It has a capacity of 60,000 m of drill core. Approximately 30,000 m of drill core is being stored in the St. John's library. Most of this core is from eastern Newfoundland, from the St. Lawrence area and the "silica survey" drilling conducted by the provincial government during the 1960's. Drill core logs and location maps have been prepared for catalogued core. The St. John's library also contains rock cutting equipment, core splitters, a stereomicroscope, a magnetic susceptibility meter, a resistivity meter, an ultraviolet light and a McPhar TV-1 scintillometer. These facilities and equipment are available for use on approved projects by exploration geologists, university researchers, the staff of the Department of Mines and Energy and other interested persons.

The Pasadena core library is also staffed on a full-time basis. This library has equipment and facilities similar to the St. John's library and has a capacity of 200,000 m of core. It has a ventilated room for storing radioactive core and a humidity-controlled room for storing salt core. There are approximately 130,432 m of core presently stored in the Pasadena library, collected from drilling sites west of Gander.

The Goose Bay core library, which contains core from Labrador, is not staffed on a full-time basis. It has a capacity of 60,000 m of core, with room for expansion. Approximately 10,113 m of core have been catalogued and placed on the rack system to date.

Plans

All "open", drill core in our three core libraries has been catalogued and a drill hole map index and computer listing of this core is available as Open File Nfld. 1479.

An extension to the Pasadena core library is in the planning stage. Limited space is available in all three core libraries for confidential storage of core. We encourage explorationists to use our facilities for core storage and related research.

MINERAL ASSESSMENT REPORT LIBRARY
MICROFICHE PROJECT

by

N.L. Mercer
Publications and Information Section

The Mineral Development Division maintains a geological and mineral resource assessment file system which is referred to as the "Mineral Assessment Report Library". This library presently consists of approximately 9,000 geological and geochemical reports, maps, journal articles and mineral assessment files, making them the largest and most comprehensive single collection of geoscience documents about Newfoundland and Labrador.

As a result of the high level of mineral exploration activity experienced during the late 1970's and early 1980's throughout the province, the amount of new data submitted increased substantially. New information is now available on many of the old and numerous new mineral occurrences in the province. Much more is now known about the geology and mineral potential of various regions, both on the island and in Labrador.

The Mineral Development Division has also conducted a large number of field projects over the past few years. This has resulted in the publication of many new geological reports, maps and open files, as well as the results of numerous geochemical surveys and surficial and aggregate resource studies.

Mining and exploration companies, prospectors, geotechnical and consultant firms, government agencies, universities, libraries and the general public are continually making use of the geofiles; requests for information have increased substantially in the past few years.

During the past five years, the Publications and Information Section has been putting all of the good quality mineral assessment reports on microfiche. This provides a much more efficient system of maintaining the geofiles. Requests for information are processed more rapidly and easily, with relatively inexpensive charges for microfiche.

The microfiche project involves daily filming of batches of reports. The reports are cross-checked before filming for quality, content and reproducibility. Two microfiche originals are made and cataloged for each file. Filing follows the standard N.T.S. system. Duplicates can be copied from the original fiche upon demand. One set of fiche originals is stored offsite at the Torbay Core Library for security and protection from fire.

Microfiche sets of mineral assessment reports covering all 1:250,000 N.T.S. map sheets in insular Newfoundland are available along with microfiche sets for many of the Newfoundland General Series reports. Several releases have also been made for microfiche sets of mineral assessment reports covering all 1:250,000 N.T.S. sheets in Labrador except 23J and 230.

Work on the Labrador mineral assessment reports is continuing and we are expecting to make several more releases of duplicate sets of microfiche by Christmas. Labrador has been the focus of our attention this year and we are expecting to complete this phase of the project in 1986.

The total cost of mineral assessment reports which are available as microfiche duplicates is $1,950.00

During 1985, we also continued placing the mineral occurrence reports on microfiche and making them available. Presently, mineral occurrence reports for N.T.S. areas 2C, 2D, 2E, 2F, 2L, 2M, 11O, 12B, 12G, 12H, 12I, 12P, 13K, 13N, 14C are available. Further releases will be made as staff in the Mineral Deposits Section complete new N.T.S. areas.

For information, please contact Norman Mercer (709) 576-3159. We look forward to your comments and suggestions in improving our microfiche system.

Acknowledgements

Doreen Mahon is thanked for her excellent work on the microfiche project this past year.

The Department of Mines and Energy also acknowledges the continued participation and cooperation of Ches Hapgood and staff of the Micrographics Section, Newfoundland Department of Public Works and Services, especially in filming and duplicating the geofiles.

ACTIVITIES OF THE COMPUTER UNIT

by

Harjit Missan
Geochemistry and Geophysics Section

The Computer Unit was established in 1982 to provide data processing service to geologists involved in data analysis. The Computer Unit has a staff of three, viz., a manager, a system analyst and a programmer. Computer application needs of the Mineral Development Division are met by the use of the mainframe computer for large databases and the use of microcomputers for smaller datasets.

The mainframe computer used by the Division is the AMDAHL 5860 situated at Newfoundland and Labrador Computer Services Centre at Higgins Line. This computer is accessed through a cluster of three terminals and a printer connected via a permanent telephone line operating at 4800 baud. Some of the programs and their applications which are used by the staff of the Division are:

SPSS-X	for management of geochemical and geological data.
SAS	for management of geochemical and geological data.
GRASP	for management of mineral deposit data.
SIR	for management of surficial geology data.

In addition, plotting programs are used for display of spatial distribution of samples and the various chemical elements.

The Division's microcomputers are used by field geologists for data analysis and plotting of geochemical diagrams, e.g. X-Y plots and ternary diagrams. Since most of the geologists are not familiar with computer systems, the emphasis has been on the development of suitable programs that can be used by geologists without them having to become familiar or proficient in either computer systems or computer languages. Data are downloaded from the AMDAHL mainframe to the Tektronix 4054 Graphic System where geologists have been using MICRO-GRASP program for data analysis.

MICRO-GRASP is a program designed for the storage, transformation, and selection of data in tabular form. The user controls the execution of MICRO-GRASP by entering a series of "commands". These commands allow users to enter new data records, establish selection criteria, calculate summary statistics, display selected data values, and perform arithmetic operations. In addition, the user can do graphics work such as plotting X-Y and ternary diagrams. These can either be drawn on the screen or output to a high resolution plotter which can produce camera ready plots.

A portable microcomputer (Compaq Portable) was used in the field this year by a departmental geophysicist; the microcomputer was used to record, store and reduce magnetic data. Once entered, the field data was manipulated to give a hard copy output either as listings or profiles. The microcomputer was used to carry out the necessary calculations and corrections to reduce the raw field data to their final format, examples of this being magnetic corrections.

In addition to providing support and help to end users, the unit will be involved in developing systems which will allow the integration of data from various disciplines within the geosciences for the purpose of highlighting areas of potential mineralization. The Division will be involved in a pilot project called Characteristic Analysis, which is a multi-variate statistical procedure developed specifically for integrating regionalized multi-variate data in geology, geochemistry, geophysics and remote sensing. This will allow a quantified analysis of the favourability of mineralized areas to contain deposits of a certain type.

REPORT OF THE GEOCHEMICAL LABORATORY FOR 1985

by

H.A. Wagenbauer
Geochemistry and Geophysics Section

Laboratory output for the past year is summarized in Table 1. The number of determinations decreased by 12% over the previous year, but all work on samples from the 1984 field season was completed prior to June 1, 1985. The decrease in output was due to a slightly lower demand for analytical work.

This respite allowed an inventory to be made of sample material remaining for the regional lake sediments and stream sediment samples collected over the past 12 years, and to commence some methods development.

Table 1

Summary of the output from the geochemical laboratory of the Mineral Development Division from September 1, 1983 to August 31, 1984.

	Number of Determinations
Geochemical Analyses of Soil, Till Lake and Stream Sediments:	48517
Silicate Analyses:	
Trace Elements:	24899
Major Elements:	12731
Miscellaneous Analyses:	
Assays, F, Ba, Sr, H_2O^+, CO_2 and S on a variety of sample types.	10254
TOTAL	96401

	Number of Samples
Sample Preparation:	
Rock Samples, Hammer Broken	107
Rock Samples, Crushed	3323
Rock Samples, Pulverized	3330
Lake, Stream and Soil Samples Sieved	2807
Miscellaneous:	
Sample Splitting, Uranium Weighing, Samples Shipped out for Analysis	4320
Inventory of weights of lake and stream sediment samples on hand	40878

During the past year the Mineral Laboratory acquired an ARL 3520 sequential quantometer from Applied Research Laboratories. The Mineral Laboratory is now in the process of setting up the instrument for the analysis of rare earths and other highly refractory elements which the laboratory was previously unable to provide to project geoscientists. A modern Graphite Furnace was added to our Atomic Absorption Equipment for the analysis of gold in the part per billion range. Considerable work has to be done before samples can be analyzed in a routine manner. It is hoped that the quantometer will be in operation by January 1986.

GEOSCAN - THE NATIONAL DATABASE FOR GEOLOGICAL INFORMATION: THE NEWFOUNDLAND CONTRIBUTION

by

Catherine Patey
Publications and Information Section

GEOSCAN is a computerized bibliographic database of Canadian-produced and/or Canada-related geoscience documents.

The Newfoundland Department of Mines and Energy is one of the ten agencies which index documents for input into this database. Our Mineral Assessment Report Library files and mineral inventory cards are the sources of our indexed documents. Other agencies, e.g. the Geological Survey of Canada and the Earth Physics Branch of the Canada Department of Energy, Mines and Resources, also produce and index documents that concern this province.

In 1982, the National GEOSCAN Center, which manages GEOSCAN, implemented a new software system, called MINISIS, to input and retrieve the bibliographic data more effectively. In the implementation of the new system, all the old documents were converted to a new format. For example, different types of keywords were moved into different fields: map types, illustrations, geological terms. Although most of the records did convert, they did not convert cleanly and completely. For example, reports may be missing a title or authors and terms may have been assigned to the wrong fields. In cooperation with the National GEOSCAN Center, these old documents are being corrected.

All new documents are input directly onto the new system and are immediately retrievable online. To date, only indexed documents from assessment files have been keyed into the system, although other types of documents, in particular government publications, have been coded.

Besides indexing and keying new documents, new coding sheets are being produced, the authority files or thesauri used in coding are being enlarged, and the terms used are being more clearly defined.

All of the 92,600 GEOSCAN records from across Canada, including those concerning this province, are available through online computer searches at the Geological Survey of Canada Library in Ottawa and, in St. John's, at our Publications and Information Section. Searches are performed on a cost-recovery basis with a minimal charge of $10.00 per search topic. A moderate size search (100-200 titles) costs between $15 and $45.

As well, GEOSCAN Newfoundland and Labrador indexes current to February 1982, the date of the last update on the old system, are available from the Publications and Information Section. A computer printout sorted by N.T.S. area is also available for the newer documents.

We welcome suggestions for improvements and appreciate being notified of any errors or discrepancies that you may discover in the earlier indexes. This will aid us in making detailed modifications of the documents.

For further information on GEOSCAN, please contact Catherine Patey (709) 576-3159.